A Q U A P H Y T E

A Newsletter about Aquatic, Wetland and Invasive Plants

Center for Aquatic and Invasive Plants
with support from
The Florida Department of Environmental Protection,
Bureau of Invasive Plant Management
The U.S. Army Corps of Engineers,
Waterways Experiment Station,
Aquatic Plant Control Research Program
The St. Johns River Water Management District

UNIVERSITY OF FLORIDA
Institute of Food and Agricultural Sciences

Volume 21 Number 1 Summer 2001 **Gainesville, Florida** **ISSN 0893-7702**

It's Been Happening for Quite a While: Their Plants Invade Here, Our Plants Invade There

"One of the major problems in the fight against harmful aquatic plants in Africa, as in other parts of the world, is that infestations of particular species have often spread alarmingly before their danger is realized. This may be because the botanical identity of the plant is not known early enough, or alternatively, because it is not recognized that the plant constitutes a potential danger as a harmful plant." H. Wild, Scientific Council for Africa South of the Sahara, Project No. 14, **1961.**

The problems of invasive non-native plants have been recognized and studied around the world for quite some time--the *Spartina* invasion of England and France in the late 1800s; the *Salvinia* invasion of Ceylon in the 1940s; the current *Lantana* invasion of South Africa. And for more than 100 years, an official war has been waged against water hyacinth (*Eichhornia crassipes*) in the U.S. (recently resulting in "maintenance control" of this plant in the U.S.). Now, by Presidential decree and federal laws, the water hyacinth war has been expanded to include hundreds of invasive non-native plants, aquatic and terrestrial, which are invading the wildlands and waters of America.

To gain perspective on invasive plant problems and their solutions, wouldn't it behoove us to learn of the experiences of others, past and present, successes and failures, aquatic and terrestrial, in the U.S. and elsewhere? That's why the **APIRS** plant literature database was created: to gather from myriad scientific sources the insights and answers gleaned by invasive plant researchers around the world. Invasive plant research published in several hundred journals and books is included in this database of more than 53,000 items.

While there are many fine new books being published about invasive non-native plants (listed at http://plants.ifas.ufl.edu/books.html), the information in these books generally is extracted from the research. The following publications represent a fraction of the thousands of research items in the **APIRS** collection that are specifically about plant invasions, ecology and biology. Although the **APIRS** collection originally was devoted to aquatic plants, we are now tracking the literature of all invasive plants as well, aquatic, wetland and terrestrial. The following titles merely suggest the variety of invasive plant problems and management projects around the world. You are welcome to query the online database (http://plants.ifas.ufl.edu) or have us do it for you (kpb@gnv.ifas.ufl.edu), to obtain citation bibliographies on any invasive plants in the world.

Aiken, S.G., P.R. Newroth, I. Wile. 1979. The biology of Canadian weeds. 34. *Myriophyllum spicatum* L. Can. J. Plant. Sci. 59:201-215.

Animal Plant Control Commission, South Australia. 1994. Prohibited Aquarium and Pond Plants. Proclaimed Plant Notes, APCC-5/Aquatic/Ver2/July121994. (Australia's prohibited plant list includes some plants that are beneficial natives in the U.S., such as *Cabomba caroliniana, Hydrocotyle ranunculoides, Ceratophyllum demersum*, and *Sagittaria graminea*; some plants prohibited in the U.S. are beneficial natives in Australia, plants such as *Melaleuca quinquenervia*.)

Ashton, P.J., D.S. Mitchell. 1989. Aquatic Plants: Patterns and Modes of Invasion, Attributes of Invading Species and Assessment of Control Programmes. In: Biological Invasions: A Global Perspective, pp. 111-154. Drake, J.A. and H.A. Mooney (eds.), John Wiley & Sons, Ltd., Chichester. (A review of modes.)

Baki, B.B. 2000. Biological invasions of noxious weeds in a man-made reservoir. A case study of Timah Tasuh, Perlis, Malaysia. In: Abstracts, Third Internat'l. Weed Sci. Congress, A. Legere (ed.), Foz do Iguassu, Brazil, June 6-11; pp. 5-6. (*Leersia hexandra*, a bird food native in the U.S., is unwanted in Malaysia.)

Baldwin, J.R., J.R. Lovvorn. 1994. Expansion of seagrass habitat by the exotic *Zostera japonica*, and its use by dabbling ducks and brant in Boundary Bay, British Columbia. Mar. Ecol. Prog. Ser. 103(1-2):119-127.

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FREE! Photo-Murals for K-12 Teachers in the U.S.

These full-color photo-murals are 62 inches X 23 inches and are fully laminated. Plants shown are from around the country. To read the list of plants for each mural, go to: http://plants.ifas.ufl.edu Created especially for school teachers, the **APIRS** photo-murals are free-of-charge to teachers (K-12) in the U.S. **To obtain your free copies, please send a non-virtual request letter, on school letterhead, to APIRS Photo-Mural, Center for Aquatic and Invasive Plants, 7922 NW 71 ST, Gainesville, FL 32653.**

For non-teachers, the cost per mural is $20 each plus S/H. The *Invasive Non-Native Plants* photo-mural (SP-293) is now available. The *Native Freshwater Plants* photo-mural (SP-292) will be available in June, 2001. To purchase, call IFAS Publications, 1-800-226-1764.

These photo-murals are the result of a collaborative effort by the University of Florida Center for Aquatic and Invasive Plants; the Bureau of Invasive Plant Management of the Florida Department of Environmental Protection; Sea Grant - Florida; and Cerexagri (formerly Elf-Atochem).

Invasive Non-Native Plants

Native Freshwater Plants

Continued from Page 1

Barreto, R.W., H.C. Evans. 1995. The mycobiota of the weed *Mikania micrantha* in southern Brazil with particular reference to fungal pathogens for biological control. Mycol. Res. 99(3):343-352.

Bentivegna, D.J., O.A. Fernandez, M.A. Burgos, M.R. Sabbatini Cerzos. 2000. Growth of *Potamogeton pectinatus* L. in the irrigation system of the Rio Colorado, Argentina. In: Abstracts, Third Internat'l. Weed Sci. Congress, A. Legere, (ed.), Foz do Iguassu, Brazil, pp. 219-220. (Native in North America, invasive in South America.)

Blossey, B., J. Kamil. 1996. What determines the increased competitive ability of invasive non-indigenous plants? In: Proceedings of the IX Internat'l. Symp. on Biological Control of Weeds, pp. 3-9. V.C. Moran and J.H. Hoffmann (eds.). 19-26 January 1996, Stellenbosch, South Africa. University of Cape Town. (*Lythrum salicaria* is also attacking South Africa.)

Bossard, C.C., J.M. Randall, M.C. Hoshovsky, eds. 2000. Invasive Plants of California's Wildlands. University of California Press, Berkeley. 360 pp. (Some invasive plants in California, such as *Spartina alterniflora* and *Spartina patens,* are desirable natives in the eastern U.S.)

Chapman, V.J., J.M.A. Brown, C.F. Hill, J.L. Carr. 1974. Biology of excessive weed growth in the hydro-electric lakes of the Waikato River, New Zealand. Hydrobiologia 44(4):349-363. (Invasive *Ceratophyllum demersum* shut down the Ohakuri power plant in 1965; however, it is a desirable native in the southeastern U.S.)

Cody, W.J., K.L. MacInnes, J. Cayouette, S. Darbyshire. 2000. Alien and invasive native vascular plants along the Norman Wells pipeline, District of Mackenzie, Northwest Territories. Canadian Field Naturalist 114(1):126-137.

Crowder, A.A., J.P. Smol, R. Dalrymple, R. Gilbert, et al. 1996. Rates of natural and anthropogenic change in shoreline habitats in the Kingston Basin, Lake Ontario. Can. J. Fish. Aquat. Sci. 53(Suppl.1):121-135.

Dawson, F.H., D. Holland. 1999. The distribution in bankside habitats of three alien invasive plants in the U.K. in relation to the development of control strategies. In: Developments in Hydrobiology, J. Caffrey, P.R.F. Barrett, et al., eds. Kluwer Academic Publishers, Dordrecht, The Netherlands, pp. 193-201.

Del Fosse, E.S. (ed.) 1980. Proceedings of the Fifth International Symposium on Biological Control of Weeds. 22-29 July 1980. Brisbane, Australia. (Biological control and management of *Salvinia molesta, Rumex crispus, Hypericum perforatum,* and *Senecio jacobaea,* among other invasive plants.)

Deloach, C.J. 1991. Past successes and current prospects in biological control of weeds in the United States and Canada. Natural Areas J. 11(3):129-142.

Duncan, K.W. 1997. A case study in *Tamarix ramosissima* control: Spring Lake, New Mexico. In: Plant Invasions: Studies from North America and Europe, J.H. Brock, M. Wade, P. Pysek and D. Green, (eds.), Backhuys Publ., Leiden, pp. 115-121.

Elton, C.S. 1958/2000. The Ecology of Invasions by Animals and Plants. University of Chicago Press. 181 pp. (One of the first seers in the field.)

Ferreira, M.T., I.S. Moreira. 1995. The invasive component of a river flora under the influence of Mediterranean agricultural systems. In: Plant Invasions - General Aspects and Special Problems, pp. 117-127. P. Pysek, K. Prach, M. Rejmanek and M. Wade (eds). SPB Academic Publishing, Amsterdam. (*Paspalum distichum*, a beneficial knotgrass native to the U.S., is unwanted in Portugal.)

Gopal, B. 1987. Water hyacinth. Aquatic Plant Studies 1. Elsevier Sci. Publ., Amsterdam. 471 pp. (A monograph.)

Gritten, R.H. 1995. *Rhododendron ponticum* and some other invasive plants in the Snowdonia National Park. In: Plant Invasions - General Aspects and Special Problems, pp. 213-219. P. Pysek, K. Prach, et al (eds). 1995. SPB Academic Publishing, Amsterdam. (*Rhododendron ponticum*, native to Spain and Portugal, is unwanted in North Wales.)

Groves, R.H. 1986. Plant invasions of Australia: An overview. In: Ecology of Biological Invasions, R.H. Groves and J.J. Burdon (eds.). Cambridge University Press, London, pp. 137-149. (*Sagittaria graminea, Cabomba caroliniana, Eichhornia crassipes, Hydrilla verticillata, Lantana camara, Myriophyllum aquaticum* and *M. spicatum* are unwanted in Australia.)

Hamabata, E. 1997. Distribution, stand structure and yearly biomass fluctuation of *Elodea nuttallii*, an alien species in Lake Biwa. Jpn. J. Limnol. 58(2):173-190. (A North American species in a Japanese lake.)

Hatting, E.R. 1961. Problem of *Salvinia auriculata* Aubl. and associated aquatic weeds on Kariba Lake. Weed Research 1(4):303-306. (*Salvinia* has been an invader for years.)

Hedge, P., L.K. Kriwoken. 2000. Evidence for effects of *Spartina anglica* invasion on benthic macrofauna in Little Swanport Estuary, Tasmania. Austral Ecology 25(2):150-159. (*Spartina anglica* has made it to the other side of the world.)

Henderson, L. 1999. The Southern African Plant Invaders Atlas (SAPIA) and its contribution to biological control. African Entomol. Memoir 1:159-163. (*Lantana camara, Melia azederach* and *Lonicera japonica* are blacklisted both in Florida and in South Africa.)

Jenkins, P.T. 2000. Global policy changes needed to stop biological invasions caused by international trade. In: Third Internat'l. Weed Sci. Congress, A. Legere, (ed.), Foz do Iguassu, Brazil, p. 214.

Kartesz, J.T., C.A. Meacham. 1999. Synthesis of the North American Flora. CD, North Carolina Botanical Garden.

Kissmann, K.G. 1987. O problema das plantas invasoras na cultura do arroz. Atualidades Agricolas 1(1):4-11. (*Polygonum hydropiperoides*, native in Florida, is unwanted in Portuguese rice fields.)

Kornas, J. 1996. Five centuries of exchange of synanthropic flora between the Old and the New World. Wiadomsci Botaniczne 40(1):11-19. (In Polish; English summary) (Humans and post-Columbian plant migrations.)

Kozhova, O.M., L.A. Izhboldina. 1992. Spread of *Elodea canadensis* in Lake Baikal. Hydrobiologia 239(1):43-52.

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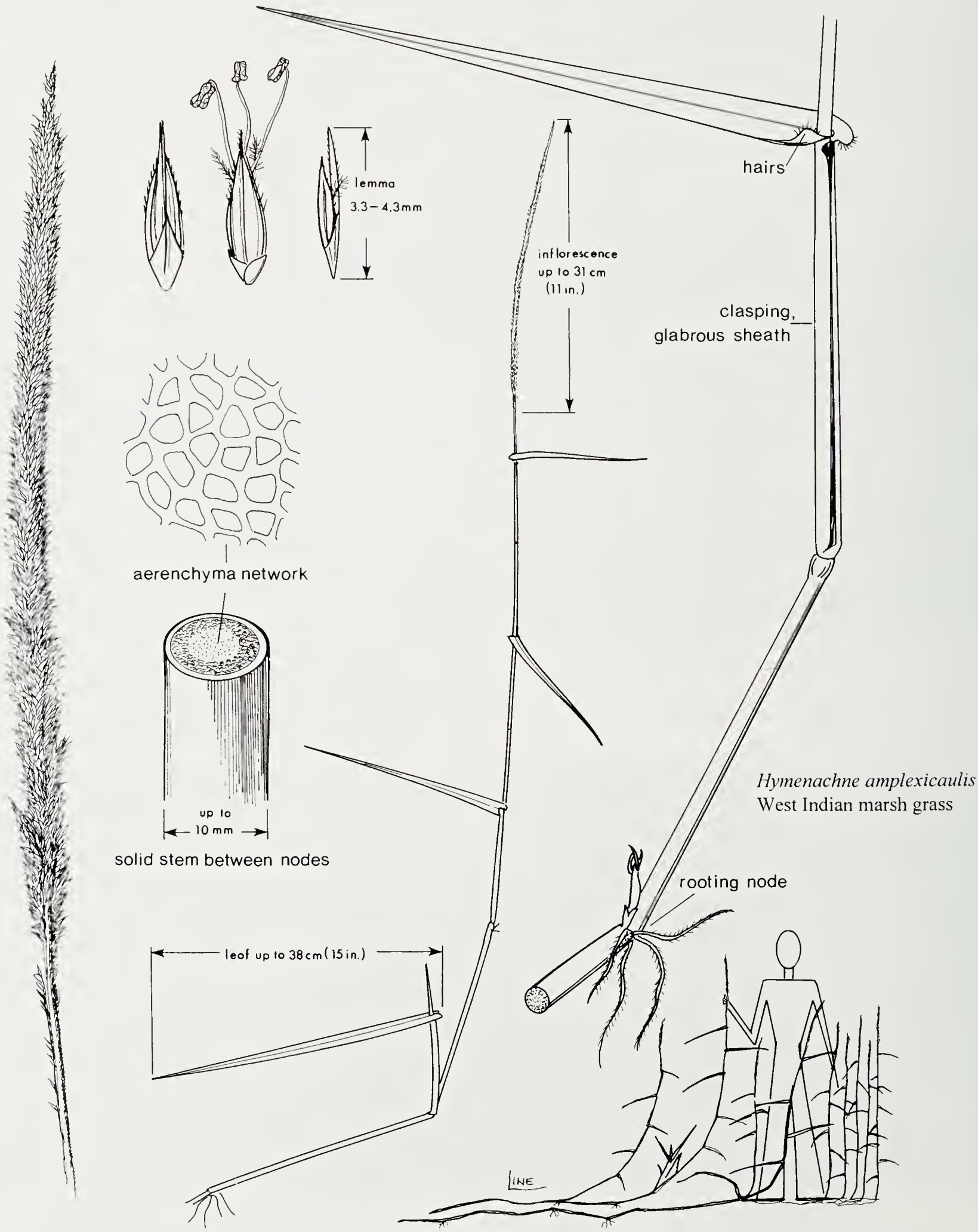
New Drawings!

These are new drawings of two aquatic plants in Florida that eco-managers need to carefully distinguish:

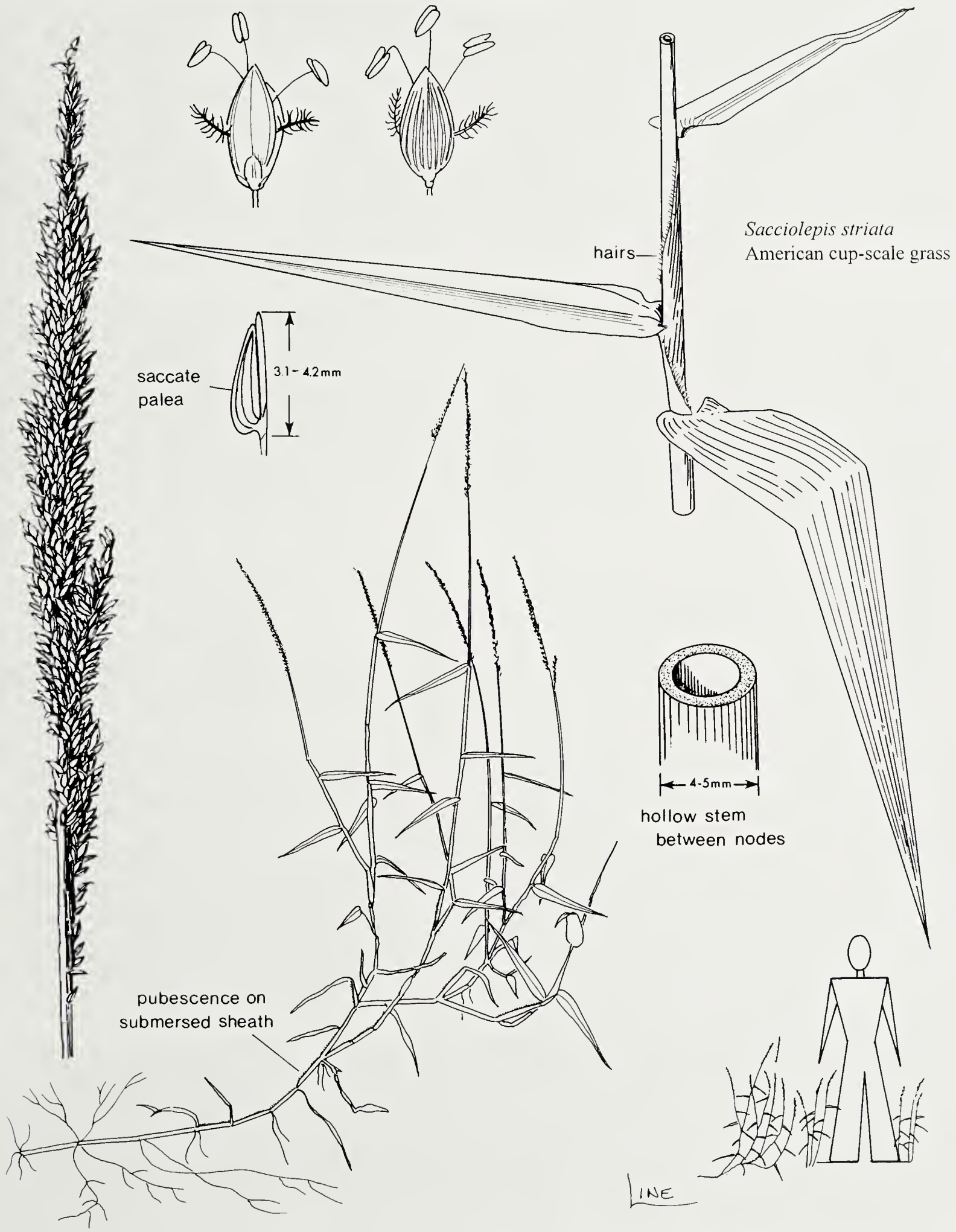
***Hymenachne amplexicaulis* is an invasive non-native plant to be controlled in Florida.**



Hymenachne amplexicaulis
West Indian marsh grass

These line drawings are by Laura Line, Center for Aquatic and Invasive Plants, University of Florida. With proper attribution and in not-for-sale items only, please feel free to use these line drawings for manuals, brochures, reports, proposals, web sites ....

Sacciolepis striata is a native plant to be promoted in Florida.



Some charophytes from the Orlando area in Florida, USA

by **Anders Langangen**, Hallagerbakken 82 b 1256 Oslo, Norway

On vacation in eastern parts of USA last summer I had a few days in Orlando, where I got the opportunity to visit a few lakes in the area. In two of these lakes I found several interesting charophytes which I would like to report.

The North American charophytes have been studied for more than one hundred years (from Allen, 1880 to Mann, et al., 1999). Still, there is much to find out, both concerning which species occur and their ecology and distribution. There is no modern flora covering the group in North America and my determinations are based on common knowledge of the group, and especially three articles which together cover the different genera of charophytes (Robinson, 1906, Allen, 1954, and Wood, 1948). Later works by the eminent American charologist Richard D. Wood (Wood 1965, 1968) have a species concept which is different from that which is in common use today. In Wood (1965) the number of species is reduced from 395 to 81, but the "old" species are still partly found as forms or microspecies. The descriptions of these are useful. Excellent drawings of many species can be found in Wood and Imahori (1964).

Florida is a tropical part of USA. The soil is rich in lime, and in the Orlando area there are a great number of lakes of different sizes. One should therefore expect to find charophytes in many of these lakes. All such finds are of interest. Material for determination can be sent to me. Determined specimens will be kept in the Botanical Museum, University of Oslo (Herb. O). Specimens can be treated as angiosperms or conserved in 70% alcohol and later put in small plastic envelopes (without alcohol) and sent.

Visited sites:

1. Florida: Osceola County: Kissimmee: Lake Cecilie, June 29, 2000. A eutrophic medium lime-rich lake with a fine white sandy bottom. Charophytes were growing in dense, mixed stands in shallow parts of the lake. Water analyses (analysed in Norway): specific resistance 316 uS/cm, chloride 20 mg/L, and calcium 14 mg/L/
2. Florida: Orange County: Orlando: Lake Crescent (at the entrance to Disney MGM Studios), June 30, 2000. A mesotrophic lake which presumably is artificial. *Nitella* was growing in shallow parts competing with phanerogames and filamentous algae.
3. Orlando: Lake Lucerne, July 1, 2000. Eutrophic lake. No charophytes were found.
4. Orlando: Lake Copeland, July 1, 2000. A strongly polluted lake without charophytes. Lakes 3 and 4 are close to the Orlando Railway Station.

The charophytes found:

1. *Nitella transilis* T.F. Allen (Icon 308 in Wood & Imahori 1964)
   Locality: USA: Florida: Orlando: Lake Crescent July 30, 2000.

Specimens monoecious to 10 cm high, green. Axes to 150 um in diameter. Internodes 1-2x the length of branchlets, to 1 cm. Both sterile and fertile branchlets 6 in a whorl, 2 (3) furcate, to 0.4 cm long. Primary rays 0.5x of branchlet length, secondaries of 4-5, of which one is a central secondary ray or antheridium. Dactyls two celled, to 1.2 mm, of which end cell is 50 um. Gametangia solitary, conjoined at (1)-2 node. Oogonium 450 um long. Oronula 100 um long and 100 um wide. Convolutions 8. Oospore 200 um long, 150 um wide. Brown reticulated membrane. Fossae 34 um. Antheridium 150 um wide.

Comments: *Nitella transilis* is a species very close to *N. tenuissima* Kutzing and is separated from this by having much shorter internodes which gives the species a more compact look. The species has been accepted by Wood (1948, 1949, and 1952). In Wood and Muenscher (1956) it is regarded as a variety of *N. tenuissima*. Allen (1954) does not accept it as a species, only as part of the variability of *N. tenuissima*. In Wood (1965) it is *N. tenuissima* f. *transilis* (Allen) R.D. Wood.

Ecology: Lake Crescent is a mesotrophic lake and the charophytes were found on shallow places inside a belt of different water plants. Wood (1952) reported the species from three localities -- one oligotrophic lake on sand bottom and two mesotrophic ponds and sand-muck bottom. The species was associated with oligotrophic/mesotrophic species such as *Nitella flexilis* (L.) Agardh, *N. megacarpa* T.F. Allen,, and *Chara braunii* Gmelin.

Distribution: North American species.

2. *Nitella leibergii* T.F. Allen (Icon 315 in Wood & Imahori 1964)
   Locality: USA: Florida: Orlando: Lake Cecilie June 29, 2000.

Specimens monoecious to 9 cm high, green. Axes to 400 um in diameter. Internodes 1-2x the length of branchlets to 1.5 cm long. Fertile branchlets 7 in a whorl, 1-2-(3)(very few) furcate, 0.6 cm long. Primaries 0.5x branchlet length, secondaries 7 (short 1/6 of primaries) again furcate into 1-2 tertiaries. Sterile branchlets 7 in a whorl, 1 and 2 (3) furcate to 1.1 cm. (Small heads with fertile whorls found on many shoots). Dactyls 4-5, uniformly 2-celled (end-cell 50 um, penultimate 0.9 mm). Gametangia conjoined at second branchlet nodes. Without mucus. Oogonia 400 um long, 300 um wide with 7 convolutions. Coronula small. Oospore 250-300 um long, 200-250 um wide with 5-6 ridges. Membrane granulate. Dark brown to golden brown oospores. Fossae 50 um. Antheridia unripe, and only found in the small undeveloped heads on some whorls.

Comments: This species is or is close to *Nitella gracilis* (Smith) Agardh. It differs from this by having strictly 2-celled dactyls. Other similar species are *N. intermedia* Nordstedt in Allen and *N. minuta* Allen.

Ecology: Lake Cecilie is a eutrophic lake and *Nitella* were growing here in dense stands.

Distribution: North American species.

3. *Chara sejuncta* A. Braun (Icons 99 and 100 in Wood & Imahori 1964)
(= *C. compacta* Robinson)

Locality: USA: Florida: Orlando: Lake Cecilie June 29, 2000.

Plants to 6 cm high, green. Axes 550 um in diameter. Internodes to 1 mm. Cortex regularly triplostichous, isostichous. Spine-cells solitary to 250 um long, commonly shorter, acute, at older internodes not visible. Stipulodes in two rows. Upper row to 750 um long, lower row 250 um. 10-11 branchlets in each whorl, to 1-2x the length of the internodes. Number of branchlet segments 11. Lowest branchlet segment ecorticate, others corticated. Anterior bract-cells two, bracteoles two, both as long as the oogonium, posterior bract-cells five?, short, to 150 um long. Monoecious, sejoined. Oogonium 1000 um long; including coronula, 600 um wide. Antheridium 300 um wide.

Comments: This is a species similar to the widespread *Chara zeylanica* Klein ex. Willd., but differs from this by having sejoined (at different branchlet nodes) gametangia.

Ecology: Little is known about this species. In eutrophic Lake Cecilie a few specimens were found together with *Nitella* and *Chara gymnopitys*. The species is also found in "lakes in the lowlands of the Mississippi Illinois, opposite St. Louis" (Robinson 1906).

Distribution: American species, see Allen (1894).

4. *Chara gymnopitys* A. Braun (Icons 125, 127, 129, and 130 in Wood & Imahori 1964)
(= *C. cardias* Allen ex. Robinson, *C. coronatiformis* Robinson)

Locality: USA: Florida: Orlando: Lake Cecilie June 29, 2000.

Plants 4-15 cm high. Axes to 500 um in diameter. Internodes to 10 mm long. Root bulbils. Cortex diplostichous to subtriplostichous, isostichous to strongly tylacanthous on younger internodes. Spine-cells solitary from papillous to as long as stem diameter scattered and not dominating. On small specimens spine-cells are appressed to the stem both up and down. Stipulodes in one row (haplostephanous), acute, 900-1250 um long, 100 um wide, 24 stipulodes in 12 pairs. Number of branchlets in each whorl 9-12, to 10 mm, 0.5-2x the length of internodes. Number of segments 3-6, end-segment 1-celled, to 1 mm long. Branchlets total ecorticated. Bract-cells verticillate as long as or longer than the segments. Rich fertile, monoecious, conjoined at 1-3 segment. Oogonium 850 um long, to 450 um wide. Convolutions 10-13. Coronula 100 um long, 150 um wide. Oospore 550 um long, 350 um wide, black, 10-13 ridges. Fossae 50 um. Antheridium 300 um wide.

Comments: The original description of *Chara cardias* was based on material collected in Volusia County in Florida. A similar species, *C. flaccida* A. Braun is reported from Latin America (Horn af Rantzien 1950).

Ecology: According to Zaneveld (1940) *Chara gymnopitys* " is a prominent element in the rice-fields or paddies of the tropics and subtropics."

Distribution: Southeastern coast of USA (Tindall 1966). Asia (Zaneveld 1940).

References:

Allen, G.O. 1954. An annotated key to the Nitellae of North America. Bull. Torrey Bot. Club 81: 35-60.

Allen, T.F. 1880. The Characeae of America. Part 1. New York.

Allen, T.F. 1894. Note on *Chara sejuncta* A. Br. Bull. Torrey Bot. Club 21: 526.

Horn af Rantzien, H. 1950. Charophyta reported from Latin America. Arkiv för Botanik 1: 355-411.

Mann, H., Proctor, V.W., and Taylor, A.S. 1999. Towards a biogeography of North American charophytes. Aust. J. Bot. 47:445-458.

Robinson, C.B. 1906. The Characeae of North America. Bull. New York Bot. Garden 4: 244-308.

Tindall, D.R. 1966. The Systematics and Ecology of the Characeae (*Chara* and *Nitella*) of the Southwestern United States and Northern Mexico. Ph.D. Thesis University of Louisville, pp. 134-145/*Chara hydropitys* Reichenbach.

Wood, R.D. 1948. A review of the genus *Nitella* (Characeae) of North America. Farlowia 3: 331-398.

Wood, R.D. 1949. The Characeae of Woods Hole Region, Massachusetts. Biol. Bull. 96: 179-203.

Wood, R.D. 1952. An analysis of ecological factors in the occurrence of Characeae of the Woods Hole Region, Massachusetts. Ecology 33: 104-109.

Wood, R.D. 1964. Monograph of the Characeae. In: Wood, R.D. & Imahori, K., A revision of the Characeae. Vol. I. 904 pp. J. Cramer, Weinheim.

Wood, R.D. 1967. Charophytes of North America. A Guide to the Species of Charophyta of North America, Central America, and the West Indies. 72 pp. University of Rhode Island, Kingston, USA.

Wood, R.D. and Imahori, K. 1964. Iconograph of the Characeae. In: Wood, R.D. and Imahori, K., A Revision of the Characeae. Vol. II. J. Cramer, Weinheim.

Wood, R.D. & Muenscher, W.C. 1956. The Characeae of the State of New York. Mem. 338, Cornell Univ. Agric. Exp. Sta.: 3-77.

Zaneveld, J.S. 1940. The Charophyta of Malaysia and adjacent countries. Blumea 4: 1-223.

Books/Reports

THE ECOLOGY OF INVASIONS BY ANIMALS AND PLANTS, by C. S. Elton. 1958/2000. 181 pp.

(Order from University of Chicago Press, 5801 S. Ellis Ave, Chicago, IL 60637. $13.00. WWW: http://www.press.uchicago.edu)

In 1958, when first published, this book was "the bible for practitioners of a burgeoning new science: invasion biology," according to Daniel Simberloff in his forward to this new reprint. Elton himself was interested in "faunal history...ecology...and conservation," and he was especially concerned with the "serious dislocations taking place in the world today [1957]," which were causing "ecological explosions."

Writing in layman's language, Elton describes the invasion and effects of organisms invading the U.S., such as the European starling, the chestnut blight, the muskrat, and plant invasions such as *Spartina townsendii* in England. Chapters dealing with invasions and changes in continents and islands are complemented by chapter essays about population balance, "new food chains," reasons for conservation, and biological variety.

IN SEARCH OF SWAMPLAND -- A Wetland Sourcebook and Field Guide, by R.W. Tiner. 1998. 264 pp.

(Order from IWEER, P.O. Box 288, Leverett, MA 01054-0288. USD $26 plus S/H. WWW: http://www.wetlanded.com)

This primer serves as an introduction to wetlands, and provides the basic tools to identify wetlands, their plant and animal life, and their hydric soils. It is written in a nontechnical style, but may be used as a textbook for courses in wetlands or environmental science.

This illustrated book is divided into two parts. The Wetland Primer is an overview of wetland ecology, status and trends, and contains chapters on hydrology; soils; vegetation; wildlife; formation; functions; values; causes of wetland loss; and wetland protection. The Wetland Identification Guide is a field guide to 300 wetland plants, 200 wetland animals, and soils.

SEAGRASS ECOLOGY -- An Introduction, by M.A. Hemminga and C.M. Duarte. 2000. 298 pp.

(Order from Cambridge University Press, 40 W. 20 St, New York, NY 10011-4211. $80.00 plus S/H.)

"This book provides an entry point for those wishing to learn about the ecology of this fascinating group of plants, and gives a broad overview of the present state of knowledge, including recent progress in research and current research foci, complemented by extensive literature references to guide the reader to more detailed studies. As such it will be valuable to students of marine biology, and will be an excellent source of information to managers of coastal areas that harbour seagrasses."

THE JAPANESE KNOTWEED MANUAL - The Management and Control of an Invasive Alien Weed, by L. Child and M. Wade. 2000. 123 pp.

(Order from Packard Publishing Ltd, Forum House, Stirling Road, Chichester, West Sussex, PO19 2EN, UNITED KINGDOM. BP £25.00 plus S/H.)

This is a full-blown management manual about a single invasive plant. Japanese knotweed (*Fallopia japonica*) is an invasive weed in Europe, the U.S., Canada, New Zealand and Australia, found along river and stream corridors, road verges, railway embankments and in gardens and on waste ground. Based on more than ten years of research into the life-cycle, biology, ecology and management of the plant, the chapters in this very complete manual deal with recognition; related species and hybrids; history, background, habitat and spread; autecology and habitats; dispersal and regeneration; and problems and legislation. A chapter on developing an effective management program includes advice on awareness, assessment, surveying, and formulating policy. Finally, a full review of control options includes experiences with chemical control, mechanical control, biological control, manual control and disposal. A complete bibliography ends the book, which is illustrated with color photographs, diagrams and case studies.

FLORA OF FLORIDA. Volume One: Pteridophytes and Gymnosperms, by R.P. Wunderlin and B.F. Hansen. 2000. 365 pp.

(Order from University Press of Florida. USD $49.95 plus S/H. WWW: http://www.upf.com)

This is the first of an eight-volume series likely to become the standard reference for the more than 3,800 vascular plants of Florida. Wunderlin is a professor of biology at the University of South Florida; Hansen is curator of the USF herbarium.

For professionals and advanced amateurs, this volume includes keys, descriptions, line drawings, nomenclature, and distribution information for ferns and nonflowering seed plants such as pines, cedars and yews, growing in the wild in Florida.

The next volumes in the series are under way; all will be required by researchers, agencies, teachers, students and consultants who have anything to do with Florida plants.

NATURE OUT OF PLACE - Biological Invasions in the Global Age, by J. Van Driesche and R. Van Driesche. 2000. 352 pp.

(Order from Island Press USD $29.95 plus S/H. WWW: http://www.islandpress.org/econtact.html)

"Whether the world becomes a world of weeds will be decided in the next decade or two. There is not time to waste." So say the father/son authors of this book.

Part One presents the scope and history of the invasive species problem. Part Two examines the ecological consequences of and the human responses to invasions. Part Three describes what people can do about biological invasions.

THE RED DATA BOOK OF FLORA OF SERBIA. Volume One: Extinct and Critically Endangered Taxa, edited by V. Stevanovic. 1999. 556 pp.

(Order from Faculty of Biology, University of Belgrade, Takovska St. 43, 11000 Belgrade, YUGOSLAVIA. USD $85 plus S/H. E-mail: jblaz@eunet.yu)

This clearly written, well produced and reliable book, the first part of an overview of threatened and endangered floral species of Serbia, contains detailed explanations, maps, drawings and photographs of 171 species already extinct or critically endangered in this region.

The book describes the plants' status locally and globally, their distribution and habitat. The book includes taxonomic and phytogeographical notes, causes of extinction or threats to which they are exposed, conservation methods, and suggested ways for reintroducing extirpated species.

THE BIOLOGY OF MANGROVES, by P.J. Hogarth. 2000.

(Order from Oxford University Press, 198 Madison Avenue, New York, NY 10016. $34.95. WWW: http://www.oup.com)

This review of the scientific literature is all about mangrove trees: their distribution, environment, reproductive adaptations; the mangrove ecosystem, form, zonation; the mangrove community, terrestrial components, including associated plants and animals ("insects, spiders, vertebrates"); the mangrove community, marine components, including algae, root fauna, crustacea, molluscs and fish; measuring and modelling mangroves; comparisons and connections, biodiversity and biogeography; impacts and uses, mangroves and pollution, hurricanes, rehabilitation and climate change.

The book comes complete with an extensive bibliography, web site listing, recommended readings, and glossary.

WINTER GUIDE TO WOODY PLANTS OF WETLANDS AND THEIR BORDERS: NORTHEASTERN UNITED STATES, by R.W. Tiner. 2000. 91 pp.

(Order from IWEER, P.O. Box 288, Leverett, MA 01054-0288. USD $16 plus S/H. WWW:http://www.wetlanded.com)

This is a winter identification guide to 100 species of trees, shrubs and woody vines of wetlands and their borders. Illustrations of winter woody twigs and buds, persistent leaves, and other parts used for winter ID make this a unique reference.

CHECKLIST OF THE WOODY CULTIVATED PLANTS OF FLORIDA, by D. Burch, D.B. Ward, and D.W. Hall. 1988. 80 pp.

(Order from IFAS Publications, 1-800/226-1764. Ask for SP-33. Checks and credit cards accepted. $5.00 plus S/H.)

This book was published in January 1988 by the University of Florida, IFAS Florida Cooperative Extension Service. IFAS Publications still has over one thousand of these paperback books for sale for only $5.00. This checklist could serve as an historical account of cultivated exotic plants in Florida at some point in time because every woody plant on the Florida Exotic Pest Plant Council's (http://www.fleppc.org/) Category 1 list is listed as a cultivated plant in this book. The authors state, "By the industrious efforts of plant enthusiasts and importers, and the appropriate niches awaiting suitably selected species, the abundance of the world's flora is well sampled in Florida." (Remember, this was in 1988!)

PRAIRIE WETLAND ECOLOGY, edited by H.R. Murkin, A.G. van der Valk and W.R. Clark. 2000. 413 pp.

(Order from Iowa State University Press, POB 570, 2121 S. State Ave, Ames, Iowa 50010-0570. USD $79.95 plus S/H. Phone: 800-862-6657;WWW:http://www.isupress.edu)

Ten experts explain what has been learned so far from MERP, the Marsh Ecology Research Program, a joint project of Ducks Unlimited Canada and the Delta Waterfowl and Wetlands Research Station. MERP, designed as a long-term replicated experiment, studied the ecology and nutrient budgets in prairie wetlands during wet-dry cycles especially as related to marsh management for wildlife. The water level manipulated experimental cells were created in the Delta Marsh of Lake Manitoba. Prairie wetland macrophytes and algae, and the uses of these wetlands by invertebrates, birds and muskrats are discussed in detail. A very good summary reports what was learned from their extensive efforts about prairie wetland management.

FIELD GUIDE TO NONTIDAL WETLAND IDENTIFICATION, by R.W. Tiner. 1988. 224 pp.

(Order from IWEER, P.O. Box 288, Leverett, MA 01054-0288. USD $35 plus S/H. WWW: http://www.wetlanded.com)

This guide includes keys to identifying about 300 wetland plants common to freshwater wetlands from Florida to New England. Illustrations of over 270 species.

WETLAND ECOLOGY-PRINCIPLES AND CONSERVATION, by P.A. Keddy. 2000. 614 pp.

(Order from Cambridge University Press, 40 West 20 St, New York, NY 10011-4211. Hardback: USD $140 plus S/H; Paperback: USD $52.95 plus S/H)

For researchers, enviro-managers and senior undergraduates, the eminent author of this book tries "to provide some unity and coherence in the study of wetland ecology" by providing "a synthesis of the existing field of wetland ecology".

Besides including an excellent and readable overview of wetlands, this book contains chapters which summarize what is known about wetland zonation and succession, diversity, hydrology, fertility, disturbance, competition, herbivory, burial, restoration and conservation, management and research. Examples from all over the world are included.

WETLAND SYSTEMS FOR WATER POLLUTION CONTROL, Proceedings of the 7th International Conference, Volumes I, II and III, edited by K.R. Reddy and R.H. Kadlec. 2000. 1082 pp.

(Order from University of Florida, IFAS Publications, POB 110011, Gainesville, FL 32611-0011. USD $100.00 + S/H. E-mail: pub@gnv.ifas.ufl.edu)

This 3-volume proceedings includes 187 papers and 63 abstracts. Volume I includes keynote papers and papers on phosphorus removal and transformations; nitrogen removal and transformations; and pathogen removal.

Continued next page -

Volume II includes papers on optimization and modelling; ecological considerations; and subsurface flow wetland systems.

Volume III includes papers on surface flow wetland systems; industrial waste waters; agricultural waste waters and stormwater.

INVASIVE PLANTS OF CALIFORNIA'S WILDLANDS,

edited by C.C. Bossard, J.M. Randall and M.C. Hoshovsky. 2000. 360 pp.

(Order from University of California Press, Sales Department, 2000 Center Street #303, Berkeley, CA 94704, 609-883-1759. USD $29.95 plus S/H.)

This is a well-produced, well-organized and practical book of accounts for 78 non-native plant species that are listed by the California Exotic Pest Plant Council as invasive plants. "These plants cause or have the potential to cause serious damage in the state's parks, preserves and other wildlands."

Not only have the authors read the literature, but they also know how to present the scientific information with a manager's point of view. So, included for each plant are practical and reliable answers to the questions: How do I recognize it? Where would I find it? Where did it come from and how does it spread? What problems does it cause? How does it grow and reproduce? and How can I get rid of it? Also included for each plant are synonymy and California distribution maps.

The book also contains information about strategies and methods appropriate for the control of plants in parks, preserves and other wildlands.

Continued from Page 3

Les, D.H., L.J. Mehrhoff. 1999. Introduction of nonindigenous aquatic vascular plants in southern New England: a historical perspective. Biological Invasions 1:281-300. (*Cabomba caroliniana* and *Limnobium spongia*, natives to the southeastern U.S., are unwanted in the northeastern U.S.)

Monteiro, A., T. Vasconcelos, L. Catarino, eds. 1998. Proc. 10th EWRS International Symposium on Aquatic Weeds. European Weed Research Society, September 1998, Lisbon. (Since **1967**, the European Weed Research Society has met over invasive plants.)

Nohara, S., M. Hiroki. 1996. Effects of land use in the surrounding area on bamboo grass invasion into Akaiyachi Mire. In: Mires of Japan, T. Iwakuma, ed., National Inst. Environ. Studies, Tsukuba, pp. 95-98

Pieterse, A.H., K.J. Murphy. 1990. Aquatic Weeds: The Ecology and Management of Nuisance Aquatic Vegetation. Oxford University Press, New York. 593 pp. (Information about 372 aquatic species around the world.)

Prach, K., S. Husak. 1996. Invasion of alien plants. In: Floodplain Ecology and Management, pp. 93-98. Prach, H., J. Jenick, et al, (eds.). SPB Academic Publ., Amsterdam. (Among others, *Heracleum mantegazzianum* (giant hog weed) is a problem plant for river managers in Ireland, is prohibited in Washington state, and is invading Canada.)

Pysek, P. 1998. Alien and native species in Central European urban floras: a quantitative comparison. J. Biogeog. 25:155-163.

Roberts, D.E., A.G. Church, S.P. Cummins. 1999. Invasion of *Egeria* into the Hawkesbury-Nepean River, Australia. J. Aquat. Plant Manage. 37:31-34. (*Egeria* is displacing "native" *Vallisneria americana* in Australia.)

Ruiz-Avila, R.J., V.V. Klemm. 1996. Management of *Hydrocotyle ranunculoides* L.f., an aquatic invasive weed of urban waterways in Western Australia. Hydrobiologia 340:187-190. (*Hydrocotyle ranunculoides*, floating marsh pennywort, is native to the U.S. but is unwanted on Australian rivers.)

Sandlund, O.T., P.J. Schei, A. Viken, eds. 1999. Invasive Species and Biodiversity Management. Kluwer Academic Publishing, Boston. 431 pp.

Stone, C.P., C.W. Smith, et al., eds. 1992. Alien Plant Invasions in Native Ecosystems of Hawaiii--Management and Research. University of Hawaii, Honolulu. (A continent and half an ocean apart, Florida and Hawaii share some of the same invasive plants: *Psidium guajava, P. cattleianum, Schinus terebinthifolius, Ficus microcarpa, Sacciolepis indica* and others.)

Thompson, K., J.G. Hodgson, T.C.G. Rich. 1995. Native and alien invasive plants: more of the same? Ecography 18:390-402. Copenhagen. (A list of many non-native plants in Europe.)

Tjitrosoedirdjo, S.S., E.T. Wahyu. 1994. Weed Information Sheets. Southeast Asia Weed Information Center, SEAMEO BIOTROP, Bogor, Indonesia. (*Eleusine indica*, Indian goosegrass, is an invasive plant in the crops of Indonesia, as well as the U.S. and eastern Canada.)

Tsuyuzaki, S., T. Tsujii. 1992. Size and shape of *Carex mayeriana* tussocks in an alpine wetland, northern Sichuan Province, China. Can. J. Bot. 70:2310-2312.

Usher, J.F. 1971. Salvinia--a rival for water hyacinth? Cane Growers Quarterly Bull. 34:137-138. (*Salvinia* in Australia since the 1960s.)

van Wilgen, B.W., F. van der Heyden, H.G. Zimmermann, D. Magadlela, T. Willems. 2000. Big returns from small organisms: developing a strategy for the biological control of invasive alien plants in South Africa. South African J. Science 96(3):148-152. (The "Working for Water" program led to the establishment of over 200 alien plant control projects in South Africa against plants such as *Acacia longifolia, Lantana camara* and *Solanum mauritianum.*)

van der Wal, R., S. van Lieshout, D. Bos, R.H. Drent. 2000. Are spring staging brent geese evicted by vegetation succession? Ecography (23(1):60-69. (Migrating waterfowl may not be able to eat invading plants in The Netherlands.)

Velu, G., A. Rajagopal. 1996. Response of rice (*Oryza sativa*) to infestation of barnyard grass (*Echinochloa crus-galli*). Indian J. Agric. Sci. 66(6):360-362.

Wisheu, I.C., P.A. Keddy. 1994. The low competitive ability of Canada's Atlantic coastal plain shoreline flora: Implications for conservation. Biological Conserv. 68(3):247-252.

Wild, H. 1961. Harmful aquatic plants in Africa and Madagascar. CSA/CCTA Joint Publ. No. 73, Salisbury. 68 pp.

Zalba, S.M., M.I. Sonaglioni, C.A. Compagnoni, C.J. Belenguer. 2000. Using a habitat model to assess the risk of invasion by an exotic plant. Biologi cal Conserv. 93(2):203-208. (*Atriplex nummularia* invasion in Argentina.)

- V. Ramey

MEETINGS

WATERSHED SCIENCE, POLICY, PLANNING AND MANAGEMENT--Can We Make It In Florida?

June 19-21, 2001. Tampa Busch Gardens, Tampa, FL.

This is part of the Natural Resources Forum Series hosted by the Center for Natural Resources of the University of Florida. The forum "explores the interconnections and processes driving watershed management," and "allows for dynamic interaction between public and private entities."

Contact: WWW: http://gnv2.ifas.ufl.edu/%7Econferweb/nrf/

ANNUAL MEETING, PLANT GROWTH REGULATION SOCIETY OF AMERICA.

July 1-5, 2001. Miami Beach, FL.

The meeting will include presentations on any area of plant growth regulation and natural products. The PGRSA was founded in 1973, and serves scientists from very diverse disciplines.

Contact: http://www.griffin.peachnet.edu/pgrsa

41st ANNUAL MEETING, THE AQUATIC PLANT MANAGEMENT SOCIETY.

July 15-18, 2001. Minneapolis, MN.

This meeting is attended by aquatic plant researchers and managers and includes papers on the biology, ecology and management of aquatic plants. Includes a student paper competition.

Contact: WWW: http://www.apms.org/

16th ANNUAL SYMPOSIUM, FLORIDA EXOTIC PEST PLANT COUNCIL.

September 12-14, 2001. St. Augustine, FL.

Find out the latest on Florida's exotic pest plants in this state's oldest city.

Contact: Kathy Burks, kathy.burks@dep.state.fl.us

11TH INTERNATIONAL CONFERENCE ON AQUATIC INVASIVE SPECIES.

October 1-4, 2001. Hilton Alexandria Mark Center, Alexandria, VA.

This conference deals with aquatic animal and aquatic plant invaders, and will feature talks on prevention, rapid response, and management; global and regional environmental impacts; habitat/ecosystem changes; monitoring and information exchange; education and outreach initiatives; ballast water and shipping; and control technologies.

Contact: Conference Administrator, 800-868-8776. E-mail: profedge@renc.igs.net
WWW: http://www.aquatic-invasive-species-conference.org

25TH ANNUAL MEETING, FLORIDA AQUATIC PLANT MANAGEMENT SOCIETY.

October 16-18, 2001. Daytona Beach, FL.

This meeting is primarily to share control strategies among members who include government agency personnel and private companies, with an emphasis on field personnel. Includes a resource and equipment demonstration and an applicator paper competition.

Contact: WWW: http://www.homestead.com/fapms/program.html

21ST ANNUAL SYMPOSIUM, NORTH AMERICAN LAKE MANAGEMENT SOCIETY.

November 7-9, 2001. Madison, WI.

2001: A Lake Odyssey. "If you're looking for good examples of projects that have traveled the path from science to policy, to implementation, then be in Madison the first week of November 2001." This NALMS meeting will be hosted by the Wisconsin Associations of Lakes.

Contact: http://www.nalms.org/symposia/madison

2ND INTERNAT'L. CONFERENCE, PLANTS AND ENVIRONMENTAL POLLUTION.

November 15-19, 2001. National Botanical Research Institute, Lucknow, India.

This conference is sponsored by the International Society of Environmental Botanists. Various conference themes include Climate Change and Agricultural Production; Environmental Pollution and Biodiversity; Environmental Biotechnology; Plant Response to Environmental Pollution; Environmental Impact Assessment; and Environmental Education, Legislation and Economic Impact.

Contact: WWW: http://www.icpep.org or E-mail: nbri@lw1.vsnl.net.in

FROM THE DATABASE

Here is a sampling of the research articles, books and reports which have been entered into the aquatic plant database since Winter 2000.

The database contains more than 53,000 citations. To receive free bibliographies on specific plants and/or subjects, contact APIRS using the information on the back page or use the database online at http://plants.ifas.ufl.edu/

To obtain articles, contact your nearest state or university library.

Abe, K., Ozaki, Y., Mizuta, K.
Evaluation of useful plants for the treatment of polluted pond water with low N and P concentrations.
SOIL SCI. PLANT NUTRITION 45(2):409-417. 1999.

Ambrogio, D.M., Gallardo, M.T., Benson, R.F., Martin, D.F.
Use of a computer-interfaced system for determination of the inhibition of oxygen production by selected aquatic weeds in the presence of cattail (*Typha domingensis*) extract.
FLORIDA SCIENTIST 63(2):118-122. 2000.

Antuniassi, U.R., Velini, E.D., Martins, D.
Mechanical removal of aquatic weeds: operational and economic analysis.
IN: THIRD INTERNATIONAL WEED SCI. CONGRESS, ED. A. LEGERE, FOZ DO IGUASSU, BRAZIL, JUNE 2000, P. 219 (ABSTRACT). 2000.

Araki, S.
Variation of sterility and fertility in *Utricularia australis* F. *australis* in Hokkaido, northern Japan.
ECOLOGICAL RESEARCH 15(2):193-201. 2000.

Azza, N.G.T., Kansiime, F., Nalubega, M., Denny, P.
Differential permeability of papyrus and *Miscanthidium* root mats in Nakivubo Swamp, Uganda.
AQUATIC BOTANY 67:169-178. 2000.

Bagwell, C.E., Lovell, C.R.
Microdiversity of culturable diazotrophs from the rhizoplanes of the salt marsh grasses *Spartina alterniflora* and *Juncus roemerianus*.
MICROBIAL ECOLOGY 39(2):128-136. 2000.

Baki, B.B.
Biological invasions of noxious weeds in a man-made reservoir. A case study of Timah Tasuh, Perlis, Malaysia.
IN: THIRD INTERNATIONAL WEED SCI. CONGRESS, ED. A. LEGERE, FOZ DO IGUASSU, BRAZIL, JUNE 2000, PP. 5-6 (ABSTRACT). 2000.

Balashov, L.S., Zub, L.N., Savitsky, A.L.
Types of Kiev waterbodies according to floristic composition of higher aquatic vegetation.
BIOL. INLAND WATERS 1:5-12. (IN RUSSIAN; ENGLISH SUMMARY). 2000.

Banziger, R.
Spatio-temporal distribution of size classes and larval instars of aquatic insects (Ephemeroptera, Trichoptera and Lepidoptera) in a *Potamogeton pectinatus* L. bed (Lake Geneva, Switzerland).
REVUE SUISSE DE ZOOLOGIE 107(1):139-151. 2000.

Barrat-Segretain, M.-H., Henry, C.P., Bornette, G.
Regeneration and colonization of aquatic plant fragments in relation to the disturbance frequency of their habitats.
ARCH. HYDROBIOL. 145(1):111-127. 1999.

Batson, W.T.
The rushes of North and South Carolina.
J. ELISHA MITCHELL SCI. SOC. 68(1):93-101. 1952.

Bennett, A.
Potamogeton polygonifolius in Newfoundland.
BOTANICAL GAZETTE 32:58-59. 1901.

Bergmann, B.A., Cheng, J., Classen, J., Stomp, A.-M.
Nutrient removal from swine lagoon effluent by duckweed.
TRANS. AMER. SOC. AGRIC. ENG. (ASAE) 43(2):263-269. 2000.

Bessey, C.E.
The yellow water crowfoot.
AMERICAN NATURALIST 24:475. 1890.

Blazencic, J., Blazencic, Z., Cvijan, M.
Floristical and ecological study of Charophyta in water ecosystems of National Park "Durmitor" (Montenegro, Yugoslavia).
EKOLOGIJA 28(1-2):33-54 (IN SERBO-CROATIAN; ENGLISH SUMMARY). 1994.

Blindow, I., Hargeby, A., Wagner, B.M.A., Andersson, G.
How important is the crustacean plankton for the maintenance of water clarity in shallow lakes with abundant submerged vegetation?
FRESHWATER BIOLOGY 44(2):185-197. 2000.

Broughton, S.
Impact of the seed-fly, *Ophiomyia lantanae* (Froggatt) (Diptera: Agromyzidae), on the viability of lantana fruit in Southeast Queensland, Australia.
BIOLOGICAL CONTROL 15:168-172. 1999.

Browning, J., Gordon-Gray, K.D.
Patterns of fruit morphology in *Bolboschoenus* (Cyperaceae) and their global distribution.
SOUTH AFRICAN J. BOT. 66(1):63-71. 2000.

Cameron, G.N., Glumac, E.G., Eshelman, B.D.
Germination and dormancy in seeds of *Sapium sebiferum* (Chinese tallow tree).
J. COASTAL RESEARCH 16(2):391-395. 2000.

Capers, R.S.
A comparison of two sampling techniques in the study of submersed macrophyte richness and abundance.
AQUATIC BOTANY 68:87-92. 2000.

Caplen, C.A., Werth, C.R.
Isozymes of the *Isoetes riparia* complex, II. Ancestry and relationships of polyploids.
SYSTEMATIC BOT. 25(2):260-280. 2000.

Castell, J.
Farming the waters: bringing aquatic plant and animal species to agriculture.
CAN. J. ANIMAL SCI. 80(2):235-243. 2000.

Chang, E.R., Dickinson, T.A., Jefferies, R.L.
Seed flora of La Perouse Bay, Manitoba, Canada: a DELTA database of morphological and ecological characters.
CANADIAN J. BOT. 78(4):481-496. 2000.

Charlton, W.A.
Studies in the Alismataceae. X. Floral organogenesis in *Luronium natans* (L.) Raf.
CAN. J. BOT. 77:1560-1568. 1999.

Crous, P.W., El-Gholl, N.E., Walker, S.E., Schubert, T.S.

Angular leaf spot disease of *Saururus* caused by *Phaeoramularia saururi* Comb. Nov.
MYCOTAXON 72:7-13. 1999.

Davis, M.A., Grime, J.P., Thompson, K.
Fluctuating resources in plant communities: a general theory of invasibility.
J. ECOLOGY 88(3):528-534. 2000.

Donabaum, K., Schagerl, M., Dokulil, M.T.
Integrated management to restore macrophyte domination.
HYDROBIOLOGIA 395/396:87-97. 1999.

Dos Santos, M.C., Lenzi, E.
The use of aquatic macrophytes (*Eichhornia crassipes*) as a biological filter in the treatment of lead contaminated effluents.
ENVIRON. TECHNOL. 21(6):615-622. 2000.

Duke, D., O'Quinn, P., Sutton, D.L.
Control of *Hygrophila* and other aquatic weeds in the Old Plantation Water Control District.
AQUATICS 22(3):4,7-8,10. 2000.

Dyck, B.S., Shay, J.M.
Biomass and carbon pool of two bogs in the experimental lakes area, northwestern Ontario.
CAN. J. BOT. 77(2):291-304. 1999.

Epler, J.H., Cuda, J.P., Center, T.D.
Redescription of *Cricotopus lebetis* (Diptera: Chironomidae), a potential biocontrol agent of the aquatic weed *Hydrilla* (Hydrocharitaceae).
FLORIDA ENTOMOLOGIST 83(2):171-180. 2000.

Ervin, G.N., Wetzel, R.G.
Allelochemical autotoxicity in the emergent wetland macrophyte *Juncus effusus* (Juncaceae).
AMERICAN J. BOT. 87(6):853-860. 2000.

Everitt, J.H., Escobar, D.E., Webster, C.F., Lonard, R.I.
Light reflectance characteristics and film image relations among three aquatic plant species.
TEXAS J. SCI. 52(2):153-158. 2000.

Feist, B.E., Simenstad, C.A.
Expansion rates and recruitment frequency of exotic smooth cordgrass, *Spartina alterniflora* (Loisel), colonizing unvegetated littoral flats in Willapa Bay, Washington.
ESTUARIES 23(2):267-274. 2000.

Fonseca, M.S., Julius, B.E., Kenworthy, W.J.
Integrating biology and economics in seagrass restoration: how much is enough and why?
ECOLOGICAL ENGINEERING 15(3-4):227-237. 2000.

Franzaring, J., Tonneijck, A.E.G., Kooijman, A.W.N., Dueck, T.A.
Growth response to ozone in plant species from wetlands.
ENVIRON. EXPER. BOT. 44(1):39-48. 2000.

Gómez Méndez, C.E.
Evaluación de maleza acuática con relación a parámetros químicos de aqua y sedimento en el DR-086 Soto La Marina, mediante SIG y Bioestadística.
THESIS, UNIDAD ACADEMICA MULTIDISCIPLINARIA, AGRONOMIA Y CIENCIAS, UNIVERSIDAD AUTONOMA DE TAMAULIPAS, MEXICO, 121 PP. (IN SPANISH; ENGLISH SUMMARY). 2000.

Gould, W.A., Walker, M.D.
Plant communities and landscape diversity along a Canadian arctic river.
J. VEG. SCI. 10(4):537-548. 1999.

Greulich, S., Bornette, G., Amoros, C., Roelofs, J.G.M.
Investigation on the fundamental niche of a rare species: an experiment on establishment of *Luronium natans*.
AQUATIC BOTANY 66(3):209-224. 2000.

Hach, C.V., Chin, D.V., Nhiem, N.T., Mortimer, M., et al
Effect of tillage practices on weed infestations and soil seed banks in wet-seeded rice.
IN: THIRD INTERNATIONAL WEED SCI. CONGRESS, ED. A. LEGERE, FOZ DO IGUASSU, BRAZIL, JUNE 2000, PP. 51-52 (ABSTRACT). 2000.

Hattink, J.
Accumulation of technetium in duckweed.
THESIS, DELFT UNIVERSITY PRESS, THE NETHERLANDS. 2000.

Hedge, P., Kriwoken, L.K.
Evidence for effects of *Spartina anglica* invasion on benthic macrofauna in Little Swanport Estuary, Tasmania.
AUSTRAL ECOL. 25(2):150-159. 2000.

Henderson, L.
The Southern African Plant Invaders Atlas (SAPIA) and its contribution to biological control.
AFRICAN ENTOMOL. MEMOIR 1:159-163. 1999.

Hofstra, D.E., Clayton, J.S., Getsinger, K.D.
Evaluation of new herbicides for the control of submerged weeds in New Zealand.
40TH ANNUAL MEETING, AQUATIC PLANT MGMT. SOC., SAN DIEGO, CA, JULY 2000, P. 9 (ABSTRACT). 2000.

Hoven, H.M., Gaudette, H.E., Short, F.T.
Isotope ratios of 206Pb/207Pb in eelgrass, *Zostera marina*, indicate sources of Pb in an estuary.
MAR. ENVIRON. RES. 48(4-5):377-387. 1999.

Hudon, C., Lalonde, S., Gagnon, P.
Ranking the effects of site exposure, plant growth form, water depth, and transparency on aquatic plant biomass.
CAN. J. FISH. AQUATIC SCI. 57 (SUPPL. 1):31-42. 2000.

Idso, S.B., Kimball, B.A., Pettit, G.R., Garner, L.C., et al
Effects of atmospheric CO_2 enrichment on the growth and development of *Hymenocallis littoralis* (Amaryllidaceae) and the concentrations of several antineoplastic and antiviral constituents of its bulbs.
AMERICAN J. BOT. 87(6):769-773. 2000.

James, M.R., Hawes, I., Weatherhead, M.
Removal of settled sediments and periphyton from macrophytes by grazing invertebrates in the littoral zone of a large oligotrophic lake.
FRESHWATER BIOL. 44(2):311-326. 2000.

Jayakumar, M., Eyini, M., Selvinthangadurai, P.
Changes in pigment composition and photosynthetic activity of aquatic fern (*Azolla microphylla* Kaulf.) exposed to low doses of UV-C (254nm) radiation.
PHOTOSYNTHETICA 37(1):33-38. 1999.

Karpiscak, M.M., Freitas, R.J., Gerba, C.P., Sanchez, L.R., Shamir, E.
Management of dairy waste in the Sonoran Desert using constructed wetland technology.
WATER SCI. TECHNOL. 40(3):57-65. 1999.

Karst, T.L., Smol, J.P.
Paleolimnological evidence of limnetic

nutrient concentration equilibrium in a shallow, macrophyte-dominated lake.
AQUAT. SCI. 62(1):20-38. 2000.

Kaufman, L.N., Landis, D.A.
Host specificity testing of *Galerucella calmariensis* L. (Coleoptera: Chrysomelidae) on wild and ornamental plant species.
BIOLOGICAL CONTROL 18(2):157-164. 2000.

Kubanek, J., Fenical, W., Hay, M.E., Brown, P.J., et al
Two antifeedant lignans from the freshwater macrophyte *Saururus cernuus*.
PHYTOCHEM. 54(3):281-287. 2000.

Kurniadie, D., Kunze, C.
Constructed wetlands to treat house wastewater in Bandung, Indonesia.
J. APPLIED BOT. 74(1-2):87-91. 2000.

Lippok, B., Gardine, A.A., Williamson, P.S., Renner, S.S.
Pollination by flies, bees, and beetles of *Nuphar ozarkana* and *N. advena* (Nymphaeaceae).
AMERICAN J. BOT. 87(6):898-902. 2000.

Lonsdale, W.M.
Global patterns of plant invasions and the concept of invasibility.
ECOLOGY 80(5):1522-1536. 1999.

Maceina, M.J., Slipke, J.W., Grizzle, J.M.
Effectiveness of three barrier types for confining grass carp in embayments of Lake Seminole, Georgia.
NORTH AMER. J. FISHERIES MGMT. 19:968-976. 1999.

Macia, M.J., Balslev, H.
Use and management of Totora (*Schoenoplectus californicus*, Cyperaceae) in Ecuador.
ECONOMIC BOTANY 54(1):82-89. 2000.

Mack, R.N., Simberloff, D., Lonsdale, W.M., Evans, H., et al
Biotic invasions: causes, epidemiology, global consequences, and control.
ECOLOGICAL APPLICATIONS 10(3):689-710. 2000.

Marklund, O.
A new sampler for collecting invertebrates in submerged vegetation.
HYDROBIOLOGIA 432:229-231. 2000.

Martins, R.P., Borges, J.C.
Use of *Ludwigia* (Onagraceae) pollen by a specialist bee, *Diadasina distincta* (Hymenoptera: Apidae), at a nesting site in southeastern Brazil.
BIOTROPICA 31(3):530-534. 1999.

Mattila, E., Kuitunen, M.T.
Nutrient versus pollination limitation in *Platanthera bifolia* and *Dactylorhiza incarnata* (Orchidaceae).
OIKOS 89(2):360-366. 2000.

McMaster, R.T., McMaster, N.D.
Vascular flora of beaver wetlands in western Massachusetts.
RHODORA 102(910):175-197. 2000.

Meschiatti, A.J., Arcifa, M.S., Fenerich-Verani, N.
Fish communities associated with macrophytes in Brazilian floodplain lakes.
ENVIRONMENTAL BIOLOGY OF FISHES 58(2):133-143. 2000.

Micheli, F., Peterson, C.H.
Estuarine vegetated habitats as corridors for predator movements.
CONSERV. BIOL. 13(4):869-881. 1999.

Miranda, L.E., Hodges, K.B.
Role of aquatic vegetation coverage on hypoxia and sunfish abundance in bays of a eutrophic reservoir.
HYDROBIOLOGIA 427(1-3):51-57. 2000.

Mitsch, W.J., Wang, N.
Large-scale coastal wetland restoration on the Laurentian Great Lakes: determining the potential for water quality improvement.
ECOLOGICAL ENGINEERING 15(3-4):267-282. 2000.

Moore, K.A., Wilcox, D.J., Orth, R.J.
Analysis of the abundance of submersed aquatic vegetation communities in the Chesapeake Bay.
ESTUARIES 23(1):115-127. 2000.

Morris, J., Gowing, D.J.G., Mills, J., Dunderdale, J.A.L.
Reconciling agricultural economic and environmental objectives: the case of recreating wetlands in the Fenland area of eastern England.
AGRICULTURE, ECOSYSTEMS AND ENVIRONMENT 79(2-3):245-257. 2000.

Muller, U.
Periphytic primary production during spring: a sink or source of oxygen in the littoral zone?
LIMNOLOGIA 30:169-174. 2000.

Mullin, B.H., Anderson, L.W.J., Ditomaso, J.M., Eplee, R.E., et al
Invasive plant species.
COUNCIL FOR AGRIC. SCI. TECH. (CAST) ISSUE PAPER 13, 18 PP. 2000.

Norton, G.P.
Shore vegetation of Flathead Lake, Montana.
PLANT WORLD 22:355-362. 1919.

Olesen, B., Madsen, T.V.
Growth and physiological acclimation to temperature and inorganic carbon availability by two submerged aquatic macrophyte species, *Callitriche cophocarpa* and *Elodea canadensis*.
FUNCTIONAL ECOLOGY 14(2):252-260. 2000.

Paling, E.I., van Keulen, M., Wheeler, K., Walker, C.
Effects of depth on manual transplantation of the seagrass *Amphibolis griffithii*, (J.M. Black) Den Hartog on Success Bank, Western Australia.
PACIFIC CONSERV. BIOL. 5:314-320. 2000.

Palma-Silva, C., Albertoni, E.F., Esteves, F.A.
Eleocharis mutata (L.) Roem. et Schult. subject to drawdowns in a tropical coastal lagoon, State of Rio de Janeiro, Brazil.
PLANT ECOL. 148(2):157-164. 2000.

Palmer, W.A., Willson, B.W., Pullen, K.R.
Introduction, rearing, and host range of *Aerenicopsis championi* Bates (Coleoptera: Cerambycidae) for the biological control of *Lantana camara* L. in Australia.
BIOLOGICAL CONTROL 17(3):227-233. 2000.

Paradis, G., Lorenzoni, C.
Description dans un but de gestion conservatoire des stations corses de l'espéce rare *Cressa cretica* L.
J. BOT. SOC. BOT. FRANCE 9:5-34. (IN FRENCH; ENGLISH SUMMARY) 1999.

Parker, J.E., Maberly, S.C.
Biological response to lake remediation by phosphate stripping: control of *Cladophora*.
FRESHWATER BIOLOGY 44(2):303-309. 2000.

Pezeshki, S.R., Anderson, P.H., DeLaune, R.D.

Effects of nursery pre-conditioning on *Panicum hemitomon* and *Sagittaria lancifolia* used for wetland restoration.
RESTORATION ECOL. 8(1):57-64. 2000.

Pitelli, R.A., Nachtigal, G.F., Pereira, A.M., Borsari, R., et al
Macrophyte population changes in Santana Reservoir, Rio de Janeiro, Brazil: five years of history.
40TH ANNUAL MEETING, AQUATIC PLANT MGMT. SOC., SAN DIEGO, CA, JULY 2000, P. 7 (ABSTRACT). 2000.

Pollard, C.L.
The families of flowering plants - II. The cat-tails, pondweeds and arrowheads.
PLANT WORLD 1:19-20. 1897.

Raven, P.J., Holmes, N.T.H., Naura, M., Dawson, F.H.
River habitat survey and its use in environmental assessment and integrated river basin management in the UK.
IN: INTERNAT'L. CONF. ASSESSING ECOLOGICAL INTEGRITY OF RUNNING WATERS, VIENNA, NOV. 1998, 20 PP.

Reichard, S.H., Hamilton, C.W.
Predicting invasions of woody plants introduced into North America.
CONSERV. BIOL. 11(1):193-203. 1997.

Richardson, D.M., Pysek, P., Rejmanek, M., Barbour, M.G., et al
Naturalization and invasion of alien plants: concepts and definitions.
DIVERSITY AND DISTRIBUTION 6:93-107. 2000.

Roalson, E.H., Friar, E.A.
Infrageneric classification of *Eleocharis* (Cyperaceae) revisited: evidence from the internal transcribed spacer (ITS) region of nuclear ribosomal DNA.
SYSTEMATIC BOT. 25(2):323-336. 2000.

Roberts, D., Sainty, G., Cummins, S., Hunter, G., et al
Managing excessive aquatic plant growth in a lake down-under: build it and they shall proliferate.
40TH ANNUAL MEETING, AQUATIC PLANT MGMT. SOC., SAN DIEGO, CA, JULY 2000, P. 8 (ABSTRACT). 2000.

Sanchiz, C., Garcia-Carrascosa, A.M., Pastor, A.
Bioaccumulation of Hg, Cd, Pb and Zn in four marine phanerogams and the alga *Caulerpa prolifera* (Forsskal) Lamouroux from the east coast of Spain.
BOTANICA MARINA 42:157-164. 1999.

Santiago, L.S., Lau, T.S., Melcher, P.J., Steele, O.C., et al
Morphological and physiological responses of Hawaiian *Hibiscus tiliaceus* populations to light and salinity.
INTERN. J. PLANT SCI. 161(1):99-106. 2000.

Schmidt, K., Jensen, K.
Genetic structure and AFLP variation of remnant populations in the rare plant *Pedicularis palustris* (Scrophulariaceae) and its relation to population size and reproductive components.
AMER. J. BOTANY 87(5):678-689. 2000.

Schmidt-Mumm, U., Posada, J.A.
Adiciones a las Haloragaceae de Colombia: *Proserpinaca palustris*.
CALDASIA 22(1):146-149 (IN SPANISH). 2000.

Schutten, J., Davy, A.J.
Predicting the hydraulic forces on submerged macrophytes from current velocity, biomass and morphology.
OECOLOGIA 123(4):445-452. 2000.

Schwarz, A.-M., Howard-Williams, C., Clayton, J.
Analysis of relationships between maximum depth limits of aquatic plants and underwater light in 63 New Zealand lakes.
NEW ZEALAND J. MAR. FRESHWATER RES. 34(1):157-174. 2000.

Seago, J.L., Peterson, C.A., Enstone, D.E.
Cortical development in roots of the aquatic plant *Pontederia cordata* (Pontederiaceae).
AMER. J. BOTANY 87(8):1116-1127. 2000.

Searcy, K.B., Hickler, M.G.
The plant communities and vascular flora of the peatland within Poutwater Pond Nature Preserve.
RHODORA 101(908):341-359. 1999.

Stadler, J., Trefflich, A., Klotz, S., Brandl, R.
Exotic plant species invade diversity hot spots: the alien flora of northwestern Kenya.
ECOGRAPHY 23(2):169-176. 2000.

St-Cyr, L., Campbell, P.G.C.
Bioavailability of sediment-bound metals for *Vallisneria americana* Michx, a submerged aquatic plant, in the St. Lawrence River.
CAN. J. FISH. AQUAT. SCI. 57:1330-1341. 2000.

Titus, J.H., Titus, P.J., del Moral, R.
Wetland development in primary and secondary successional substrates fourteen years after the eruption of Mount St. Helens, Washington, USA.
NORTHWEST SCI. 73(3):186-204. 1999.

Valentine, J.F., Heck, K.L., Kirsch, K.D., Webb, D.
Role of sea urchin *Lytechinus variegatus* grazing in regulating subtropical turtlegrass *Thalassia testudinum* meadows in the Florida Keys (USA).
MAR. ECOL. PROG. SER. 200:213-228. 2000.

Virolainen, K.M., Suomi, T., Suhonen, J., Kuitunen, M.
Conservation of vascular plants in single large and several small mires: species richness, rarity and taxonomic diversity.
J. APPLIED ECOL. 35(5):700-707. 1998.

Whigham, D.F.
Ecological issues related to wetland preservation, restoration, creation and assessment.
SCI. TOTAL ENVIRON. 240(1-3):31-40. 1999.

White, S.D., Ganf, G.G.
Lacunal anatomy and resistance to convective flow in *Typha domingensis* and *Phragmites australis*.
AQUATIC BOTANY 68:165-177. 2000.

Wingfield, R., Murphy, K.
Invasive *Elodea* problems impacting *Najas flexilis*, a rare native macrophyte in Scottish lochs.
40TH ANNUAL MEETING, AQUATIC PLANT MGMT. SOC., SAN DIEGO, CA, JULY 2000, P. 4 (ABSTRACT). 2000.

Woomer, P.L., Muzira, R., Bwamiki, D., Mutetikka, D., et al
Biological management of water hyacinth waste in Uganda.
BIOLOGICAL AGRIC. AND HORTIC. 17(3):181-196. 2000.

Workman, P.D., Walton, W.E.
Emergence patterns of *Culex* mosquitoes at an experimental constructed treatment wetland in southern California.
J. AMER. MOSQUITO CONTROL ASSOC. 16(2):124-130. 2000.

Zaitchik, B.F., Leroux, L.G., Kellogg, E.A.
Development of male flowers in *Zizania aquatica* (North American wild-rice: Gramineae).
INTERN. J. PLANT SCI. 161(3):345-351. 2000.

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AQUAPHYTE

This is the newsletter of the Center for Aquatic and Invasive Plants and the Aquatic, Wetland and Invasive Plant Information Retrieval System (**APIRS**) of the University of Florida Institute of Food and Agricultural Sciences (IFAS). Support for the information system is provided by the Florida Department of Environmental Protection, the U.S. Army Corps of Engineers Waterways Experiment Station Aquatic Plant Control Research Program (APCRP), the St. Johns River Water Management District and UF/IFAS.

EDITORS: Victor Ramey
Karen Brown

AQUAPHYTE is sent to managers, researchers and agencies in 71 countries around the world. Comments, announcements, news items and other information relevant to aquatic plant research are solicited.

Inclusion in *AQUAPHYTE* does not constitute endorsement, nor does exclusion represent criticism, of any item, organization, individual, or institution by the University of Florida.

From left to right: Paul Cox, Director, NTBG; C.D.K. Cook, Honoree; Douglas McBryde Kinney, Chairman, NTBG Board of Trustees

Christopher D.K. Cook, explorer, taxonomist and teacher, who is also the global authority on aquatic vascular plants, has been awarded the **David Fairchild Medal for Plant Exploration.** The Fairchild Medal is the world's most prestigious award for plant discovery and conservation, an award which "honors distinguished service to humanity." The ceremony took place February 9, 2001, in Coconut Grove (Miami), Florida at *The Kampong*, an exquisite home overlooking Biscayne Bay and the former home of David Fairchild.

Presenting the medal (as well as a citation and a check) were Paul Alan Cox, director of the National Tropical Botanical Garden (NTBG), and Douglas McBryde Kinney, Chairman of the NTBG Board of Trustees. The NTBG is comprised of five gardens and three preserves in Florida and Hawaii and is dedicated to conservation, research and education relating to the world's tropical plants.

Professor Cook is the well-known and well-traveled author of numerous books and scientific articles on aquatic plants of the world, including *Waterplants of the World*, first published in 1974. He also developed Switzerland's Institute for Systematic Botany and the Botanic Gardens at the University of Zurich.

A Q U A P H Y T E

A Newsletter about Aquatic, Wetland and Invasive Plants

Center for Aquatic and Invasive Plants
with support from
The Florida Department of Environmental Protection,
Bureau of Invasive Plant Management
The U.S. Army Corps of Engineers,
Waterways Experiment Station,
Aquatic Plant Control Research Program
The St. Johns River Water Management District

UNIVERSITY OF FLORIDA
Institute of Food and Agricultural Sciences

Volume 21 Number 2 Winter 2001 **Gainesville, Florida** **ISSN 0893-7702**

Are Aquatic Herbicide Permitting Changes on the Horizon?

[**Editor's note:** During the summer of 2001, few, if any, herbicide applications to manage aquatic plants, took place in Washington state. As a result of that state's interpretation of a federal circuit court ruling, aquatic plant management operations using aquatic herbicides, as well as mosquito and burrowing shrimp control activities, now require a National Pollutant Discharge Elimination System (NPDES) permit. NPDES permits were originally created by the U.S. Clean Water Act. Though the circuit court ruling may be interpreted and implemented in different ways by the nine states of the circuit, nonetheless, aquatic pesticides, even when registered and labeled under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), now are considered in one circuit district to be a form of pollution requiring additional permitting under the Clean Water Act. The ruling also effectively federalizes what used to be a state permitting power in the 9th Circuit.

As of now, no entity in the nine states has appealed the Talent decision to the U.S. Supreme Court. The ruling suggests implications for all herbicide-based management operations on public waters and lands of the U.S. Here, Ms. Hamel presents a brief review of the decision and her department's implementation of its findings. *VR*]

The Impact of the Talent Irrigation District Court Decision on Aquatic Pesticide Regulation in Washington State

by Kathy S. Hamel, Washington State Department of Ecology, P.O. Box 47600, Olympia, WA 98504-7600, kham461@ecy.wa.gov

Background

Many irrigation districts in the western United States for many years have routinely applied acrolein (Magnacide H) to their ditches and canals to control the growth of submersed aquatic vegetation. Removing vegetation is essential to maintain water delivery to crops and to prevent flood damage to the canals. Acrolein is highly toxic to fish, wildlife, and humans and must be carefully applied. The districts use acrolein, instead of the less toxic aquatic herbicides used for aquatic plant control in lakes and rivers, because acrolein treated water can be used for crop irrigation much sooner than other aquatic herbicides.

In May 1996, the Talent Irrigation District in southwestern Oregon applied acrolein to the Talent Canal. The next day dead fish were discovered in Bear Creek around and downstream from a leaking canal waste gate. Over 92,000 juvenile steelhead were killed. Release of treated waters into a fish-bearing stream clearly violated the Magnacide H label and the District was heavily fined by Oregon agencies for the fish kill. Environmental groups (Headwaters, Inc. et al.) also sued Talent for violating the Clean Water Act (CWA) by treating its canals without a National Pollutant Discharge Elimination System (NPDES) permit. **Continued on Page 10**

Federal Regulations Reviewed:

The **Clean Water Act (CWA)**, as originated in the Federal Water Pollution Control Act Amendments of 1972, generally prohibits the discharge of pollutants into "navigable waters" or "waters of the United States." The CWA's objective "is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." It requires a **National Pollutant Discharge Elimination System (NPDES)** permit before any pollutant can be discharged into navigable waters from a point source. Point sources are defined as discrete conveyances such as discharge pipes or man-made ditches. Permits typically are obtained for discharges of industrial wastewater, sewage treatment plant effluent, etc.

The **Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)** is a comprehensive federal statute which regulates pesticide use, sales, registration and labeling, and grants enforcement authority to the **Environmental Protection Agency (EPA)**. FIFRA's objective is to protect human health and the environment from harm from pesticides.

FIFRA establishes a national uniform labeling system to regulate pesticide use, but does not establish a system for granting permits for individual herbicide applications. The CWA establishes national effluent standards to regulate the discharge of all pollutants into the waters of the United States, but also establishes a permit program that allows, under certain circumstances, individual discharges. FIFRA's labels are the same nationwide, and so the statute does not and cannot consider local environmental conditions. By contrast, the NPDES program under the CWA does just that.

From the U.S. Court of Appeals, Ninth Circuit, Opinions

Rare and Unusual Aquatic Sedge is Invasive in Florida

by Colette Jacono, US Geological Survey

Heavy growth of *Scleria lacustris* covers several hectares in water 40 cm deep. Many additional colonies are scattered in the distance. *Photo by Vic Ramey.*

What could be unusual about another invasive plant in Florida? Our most southern and species-rich state has surely received an overly generous share of "out-of-place" plants. In fact, *Scleria lacustris* C. Wright, more simply called Wright's Nut-rush, is strikingly unusual in many respects.

As a sedge (family Cyperaceae) it is atypical in existing as an annual species, truly aquatic in nature. The juvenile plants are well adapted to water influx during the summer growing season, developing thick, spongy stems and rooting at the nodes when submersed. The fibrous, floating roots help support the upright growth of plants until maturity and later the lodging that ensues across standing water in late season.

Scleria lacustris is extraordinary for its large size and robust stature. Where late season water levels reach 30 cm, single stemmed plants can grow to over two meters long while the stems expand to a hefty thickness of 2.5 cm. Plants develop multiple culms and a smaller stature; yet mature equally well where water has withdrawn in autumn.

Scleria lacustris is exceptional not only for its singular beauty but for its beastly touch. Silica impregnated prickles along the stem and leaves impart a deep slicing wound when handled. And finally, *Scleria lacustris* is rarely found in its native range, which extends across the tropics of Africa and America.

What may not be unusual about *Scleria lacustris* is the time lag, in this case twelve years, that has elapsed between early collections and the first troubling populations in Florida. Researchers acquainted with the task of reviewing herbarium specimens to analyze invasion processes typically find similar initial lag patterns in distribution.

In conservation marshes of central Florida, *Scleria lacustris* has demonstrated the ability to disperse rapidly and to develop into dense colonies. Open marshes subjected to hydroperiod fluctuations appear especially vulnerable. It is suspected that ducks and airboats may disperse the shining white nutlets. Nutlets may also float through drainage systems, leaving vast open water marshes, including the Everglades, at risk.

Recognize *Scleria lacustris* by its wide (~2 cm) pleated leaves, thick, three-angled stem streaked in red, and upright branching inflorescences full of large (to 4 x 2.5 mm), whitish shining nutlets.

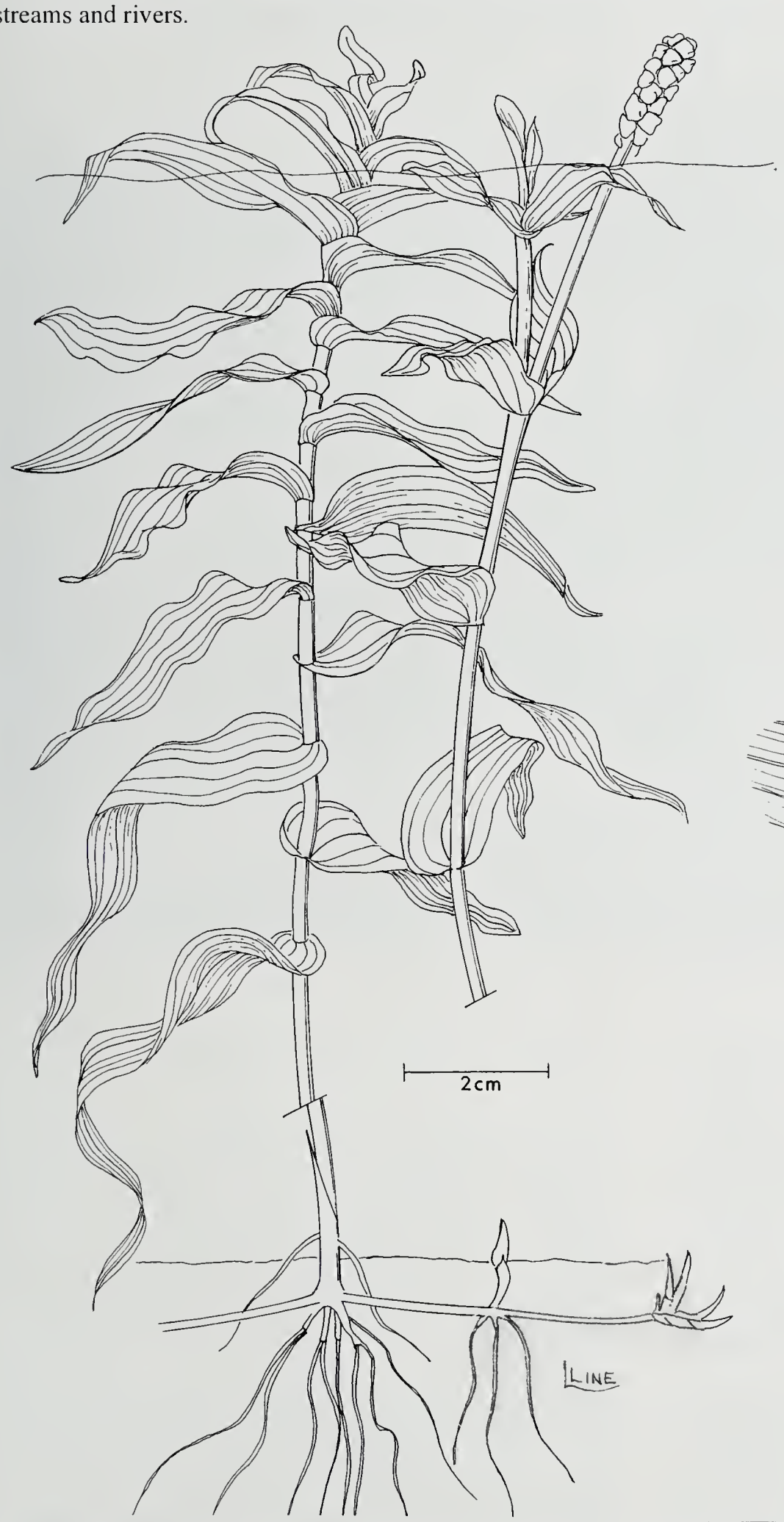
Full results of findings are in press: Jacono, C.C. 2001. *Scleria lacustris* (Cyperaceae), an aquatic and wetland sedge introduced to Florida. Sida, Contributions to Botany 19(4). If you know of this plant, either in or out of its native place, please contact:

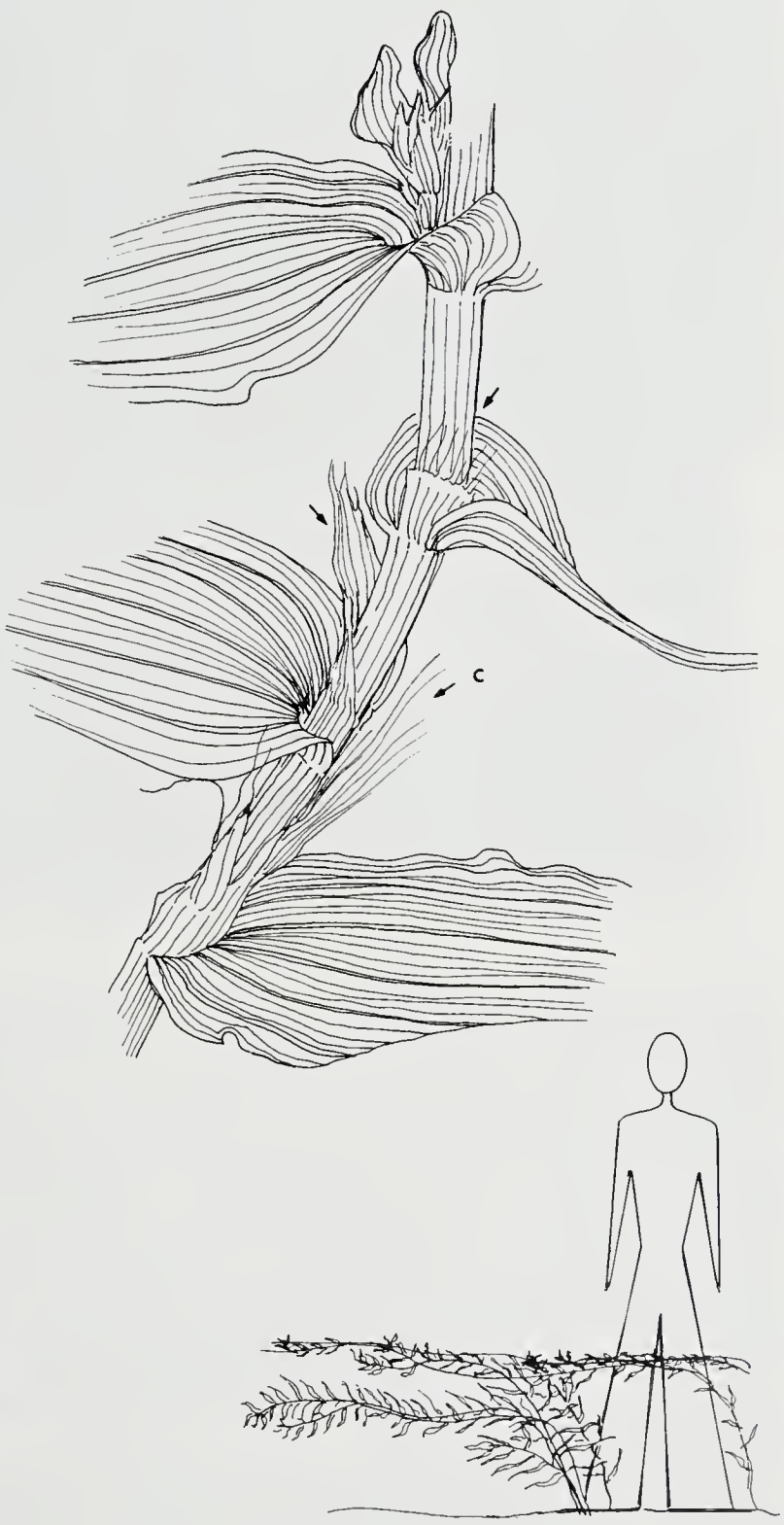
Colette Jacono, U.S. Geological Survey, 7920 NW 71st St., Gainesville, Fl 32653; (352) 378-8181 X 315; Colette_Jacono@usgs.gov

Download a color flyer of *Scleria lacustris* from this site: ftp://ftp.fcsc.usgs.gov/pub/nas/plants/Scleria_flyer.jpg
Save the .jpg file to your computer; open with Photoshop and size, if necessary; print.

Richardson's pondweed (*Potamogeton richardsonii*) is another pondweed native in North America. It occurs throughout Canada and much of the U.S., except that it has not been reported in the south central and southeast U.S. In some places it becomes weedy. This submersed plant grows in shallower waters of lakes, ponds, marshes, reservoirs and slow-moving streams and rivers.

Richardson's pondweed
Red-head pondweed
Potamogeton richardsonii





Preliminary Note on the Floating Islands of Zacatón Sinkhole, Mexico

by **Chet Van Duzer**, 12177 Winton Way, Los Altos Hills, California 94024; E-mail: ChetV@aol.com

Photo by Marcus Gary, USGS

On El Rancho Azufrosa near the small town of Aldama (22° 55'N, 98°04'W) in the state of Tamaulipas in northeastern Mexico, there is a remarkable group of five cenotes or sinkholes, vertical caves filled with fresh water. The water in the sinkholes is highly mineralized, smelling strongly of sulfur, and is also quite warm, with average temperatures ranging from 28.3°C to 33.8°C. One of these cenotes, called Zacatón, is the world's deepest known water-filled pit, more than 305 meters deep, and is the site of the world's deepest scuba dive, which was made by Jim Bowden, leader of El Proyecto de Buceo Espeleologico México y América Central, a group of divers which has been exploring the sinkholes since 1989.

While the depths of Zacatón are of speleological interest, its surface is of botanical interest for the lush floating islands that move across it. The cenote's surface is circular, about 100 m in diameter, and is surrounded by 21 m high rocky cliffs. On the water are fifteen floating islands, ranging in diameter from 3 to 10 m, and 1 to 1.5 m thick. Beneath the water, the edges of the islands are essentially vertical, a result of the islands' collisions with each other and with the vertical rock "shores." The islands are moved only by the wind; there are no currents in Zacatón.

The flora of the floating islands is dominated by a grass known as "zacate," and in fact it was the distinctive islands of zacate that gave the cenote its name "Zacatón." This grass has not yet been collected and identified. The names "zacate" and "zacatón" are applied to several different species, including *Muhlenbergia robusta*, *Festuca amplissima*, and *Sporobolus wrightii*, as well as other species in these genera. A *Sporobolus* grass seems the most likely candidate, as *Muhlenbergia* spp. and *Festuca* spp. are typically found in dry environments, while *Sporobolus* spp. are known to grow in desert marshes, playa lakes, and floodplains. A small number of shrubs and cacti also grow on the islands, and the islands are inhabited by turtles and snakes. I have heard a report of floating islands of zacate grass which are called "zacatones" in Laguna Verde near Coapilla (93°9'59"W, 17° 7'59"N), Chiapas, Mexico. These islands might prove interesting to compare with those of Zacatón, but information about the islands in Laguna Verde has not been forthcoming.

Perhaps the most interesting question raised by the floating islands of Zacatón is how they formed. There are no shelves near the water's surface on which a colony of grass might grow, become dislodged, and float, and indeed there are no stands of this species of grass in the immediate vicinity of the sinkhole. Further, there are no shallow underwater shelves upon which humus might have accumulated, become buoyant due to decompositional gasses, and then been colonized by the grass. Marcus Gary, a hydrologist with the U.S. Geological Survey who is studying the Rancho Azufrosa sinkholes, has suggested to me that the islands may have formed on buoyant "skins" of travertine, a precipitate of calcium carbonate. There are other sinkholes in the area that are now filled with travertine deposits. It seems that the chemistry of Zacatón's waters has changed so that travertine is no longer forming, and may in fact be dissolving, but the islands remain. Over time, dust would have accumulated on these travertine rafts, and the grass seeds might have been carried to Zacatón by birds -- this area is well known among birdwatchers, and many different species of birds live in and around the cenotes.

Other floating islands have formed on travertine rafts. A lake now called Lago della Regina, and formerly known as Lacus Albuleus, La Solfatra, or Lago delle Isole Natanti, near Tivoli, Italy, once had vegetated floating islands formed on floating masses of travertine. These were famously described by Athanasius Kircher and Francesco Lana in the 17th century, and in more detail by Sir Humphry Davy in the 19th century, not long before they ceased to exist, probably because water was diverted from the lake to supply thermal baths. Lana describes these floating islands as follows: "I myself saw several of these islands in a small lake of sulfurous water not far from the Tiber; they were mostly circular or oval, and rose four or six inches above the water. Their surface is flat and grassy, and at the edges of some of them a few larger plants grow, which act as sails, so that even the slightest breeze pushes the islands from one part of the lake to another. The largest of them are a few yards in diameter, yet nonetheless can sustain several men standing upon them."

Hopefully an opportunity for a thorough investigation of the floating islands of Zacatón, including a survey of their flora and fauna, will present itself soon.

References:

Brand, Charles J., and Merrill, Jason L., "Zacaton as a Paper -making Material," *United States Department of Agriculture Bulletin* No. 309 (November 4, 1915) (28 pp.).

Brown, David E., "Chihuahuan Desertscrub," p. 169-79 in David E. Brown, ed., *Biotic Communities of the American Southwest -- United States and Mexico* (Tucson, 1982) (p. 175 on the occurrence of *Sporobolus wrightii* and *Sporobolus airoides* in wetland communities).

Davy, Humphry, Sir, *Consolations in Travel, or, The Last Days of a Philosopher* (London, 1830) (p. 122-9 gives an account of the floating islands in La Solfatara or Lago della Regina).

Gary, Marcus, "Speleogenesis of Zacatón and Cenotes of Rancho La Azufrosa," Poster Presentation, American Academy of Underwater Sciences 20th Annual Symposium, "Diving for Science in the 21st Century," 11 to 15 October 2000, Sirata Beach Resort, St. Petersburg Beach, Florida.

Kircher, Athanasius, *Latium; id est, Nova & parallela Latii tum veteris tum novi descriptio* (Amsterdam, 1671) (Book 4, Part 3, chapter 4 on the floating islands in the Lago della Regina).

Kristovich, Ann, "Zacaton. A History," *Nitrox Diver Magazine* 94.4 (Nov. 1994 - Jan. 1995) (on scuba diving in Zacatón; online at http://www.iantd.com/articles/94-4kristovich.html).

Lana Terzi, Francesco, *Magisterium naturae, et artis* (Brescia, 1684-92) (Vol. 3, Book 25, chapter 1, number 54 on the floating islands in the Lago della Regina).

Mr. Van Duzer is currently compiling a global bibliography on floating islands. Here follow some additional citations from this bibliography relating to the floating islands near Tivoli:

Bacci, Andrea, *Discorso delle acque Albule, bagni di Cesare Augusto a' Tivoli, delle acque acetose presso a Roma, & delle acque d'Anticoli* (Rome, 1564) (32 p.; esp. p. 3-4 on the qualities of the water and on the floating islands in Lago della Regina).

Cappello, Agostino, *De' bagni minerali presso Tivoli* (Rome: *Tipofrafia delle belle arti*, 1839) (29 p., offprint from *Giornale Arcadico*, vol. 80; p. 15-7 on the floating islands).

Kircher, Athanasius, *Latium; id est, Nova & parallela Latii tum veteris tum novi descriptio* (Amsterdam, 1671) (describes the floating islands near Tivoli in Book 4, part 3. chapt. 4.; the islands were known as *le sedici barchette*, "the sixteen little boats," and are mistakenly depicted as boats on the map of the lake and surrounding regions in Book 3, part 2, chapt. 1).

Gigli, Girolamo, *Il Gorgoleo ovvero il governatore dell'isole natanti* (Sienna, 1753) (a comedy; in Act 1, Scene 2, p. 14-5 the characters discuss the floating islands of Acque Albule near Tivoli, mentioning some of the names of the individual islands, and that local shepherds ride on the islands).

Viale, Benedetto, and Latini, Vincenzo, *Sulle Acque Albule presso Tivoli: Analisi chimica* (Rome: Tipografia di Gaetano Menicanti, 1857) (76 p.; p. 12-4, 49, 69, and 74 on the floating islands).

Zezi, Pietro, "The Travertine and the Acque Albule in the Neighbourhood of Tivoli," p. 83-8 in Henry James Johnston-Lavis, ed., *The South Italian Volcanoes, Being the Account of an Excursion to Them Made by English and Other Geologists in 1889 Under the Auspices of the Geologists' Association of London* (Naples, 1891) (p. 85-6 on the Lago della Regina, with brief reference to its floating islands).

Books/Reports

ALIEN WEEDS AND INVASIVE PLANTS: A Complete Guide to Declared Weeds and Invaders in South Africa,

by L. Henderson. ARC-PPRI Handbook No 12. 2001. 300 pp.

(Order from Weeds Division, Plant Protection Research Institute, Private Bag X 134, Pretoria, 0001, South Africa. E-mail: riethdb@plant2.agric.za US$25 includes postage by surface mail.)

Compact yet full of understandable text and symbols, here's another especially nicely-designed handbook for the identification of invasive plants. It includes descriptions, distributions, line drawings and photographs of 234 species of non-native plants in South Africa. It includes all of their "declared weeds", contained in Category 1 (prohibited and must be controlled); Category 2 (commercially used, may be grown in permitted areas); and Category 3 (ornamentally used, existing plantings okay but may no longer be planted), divided into six sections: Grasses and Reeds (10 spp.); Aquatics (10 spp.); Terrestrial Herbs (38 spp.); Climbers (25 spp.); and Trees and Shrubs (155 spp.). An inside-cover "quick guide" makes this handbook even easier to use.

PLANT INVADERS -- The Threat to Natural Ecosystems,

by Q.C.B. Cronk and J.L. Fuller. 2001. 241 pp.

(Order from Earthscan Publications Ltd, 120 Pentonville Road, London N1 9JN, UK. £24.95. WWW: http://www.earthscan.co.uk E-mail: earthinfo@earthscan.co.uk)

The first three chapters of this small book provide cogent and succinct definitions and descriptions of plant invasions, how they occur, and what is done about them. Among other things, this "conservation manual" is intended to "provide information which will assist botanists and others to undertake practical conservation work." It also contains reviews of 17 invasive species around the world, including their description, distribution, invasiveness, and control and management.

SUBMERGED AQUATIC VEGETATION: Data Development and Applied Uses - A CD-ROM,

by the Coastal Services Center, U.S. National Oceanic and Atmospheric Administration. 2001. CD-ROM.

(Order this free publication from NOAA Coastal Services Center, WWW: http://www.csc.noaa.gov/clearinghouse)

This well-conceived (and free of charge!) CD "was designed to provide information, mapping methodologies, and data applications for both the coastal resource manager and the submerged aquatic vegetation (SAV) data developer." The CD presents examples of uses of SAV data, methodology for creating seagrass data, technical support from the Benthic Habitat Mapping project, and general information about legislation and funding opportunities for SAV mapping projects.

The CD also includes two books (in PDF format), and approximately 100 additional photographs of habitat, etc. One book is a "Seagrasses Overview"; the other is an ID manual--Field Guide to the Seagrasses of the United States, including the Caribbean.

The well-done Overview is 20 pages, and contains chapters about the values (contributions to the ecosystem) of seagrasses, threats against seagrasses, and protection of seagrasses. The Field Guide includes nicely laid-out pages and ID information for 15 seagrass species (including six Halophila species), including line drawings, photographs and distribution maps. (One must be patient while using this CD -- the PDF files were able to be downloaded by only 1 of 3 PCs tested in this office. Also, the photographs printed out on the PDF pages, while large, are of inadequate resolution to be of much use in identification.)

WETLAND PLANTS: Biology and Ecology,

by J.K. Cronk and M.S. Fennessy. 2001. 462 pp.

(Order from CRC Press, 2000 Corporate Blvd. NW, Boca Raton, FL 33431-9868, 800-272-7737. WWW:http://www.crcpress.com $89.95 + S/H.)

This reference on the ecology of aquatic and wetlands plants is intended for wetland professionals, teachers and students. It might also serve as a text for upper-level college courses. Its various parts comprise a synthesis of the current knowledge on wetland plants and their communities. Part I includes an introduction to wetland plants; definitions and functions of the types of wetland plant communities including saline, brackish and freshwater systems; and an overview of physical aspects of wetland environments including hydrology and sediment conditions. Part II is about plant adaptations to wetland growth conditions including hypoxia, anoxia, salt concentrations, nutrient limitations, submergence and herbivory; reproduction mechanisms and seedling adaptations; and special structures for asexual reproduction. Part III explains primary productivity; discusses community dynamics elements such as succession, competition, allelopathy and disturbance; and presents case studies of several major invasive plants. Part IV describes wetland restoration and creation of artificial wetlands, with case studies; and explains how wetland plants may be used as indicators of wetland boundaries and ecological integrity.

COASTAL PLANTS FROM CAPE COD TO CAPE CANAVERAL,

by I.H. Stuckey and L.L. Gould. 2001. 305 pp.

(Order from University of North Carolina Press. $29.95 (hard); $14.95 (soft). WWW: http://uncpress.unc.edu Phone: 800-848-6224.)

This is a nice book about 125 most-frequently-encountered plants of coastal habitats from Massachusetts to northern Florida, "focusing on vascular plants that grow in saline situations". Included for each plant is a single photograph (but no drawings) and a plant description which includes growth habit and life history, pollination biology and seed dispersal, blooming dates (!), synonymy, uses of the plant by people and wildlife, and other interesting facts. There is a glossary, but no key. The book is arranged by family.

Because there is no kind of key to the plants, the book is not particularly user-friendly for first-timers in coastal habitats: there'll be much page-flipping. But the text is very friendly and interesting.

HANDBOOK FOR RESTORING TIDAL WETLANDS,

edited by J.B. Zedler. 2001. 439 pp.

(Order from CRC Press, POB 31225, Tampa, FL 33631-3225, 1-800-272-7737. WWW: http://www.crcpress.com $89.95 + S/H.)

This book "provides a broad-based compilation of case studies [from southern California] and principles to guide" the planning, implementation and assessment of coastal mitigation and restoration projects. In the book, various respected scientists redefine the theory of restoration ecology, considering the special concerns of coastal wetland restoration and salt marshes; discuss "the critical phase" of setting restoration goals and identifying reference ecosystems; focus on wetland topography, hydrology, and soil characteristics; describe in detail methods for selecting, salvaging, holding, propagating and transplanting salt marsh plants; make recommendations on how to improve salt marsh restoration in terms of fishes and invertebrates; present new information on methods for surveying, monitoring and assessing; and planning and budgeting for maintenance and long-term management of restored sites.

The authors cover a lot of ground in 439 pages.

MINNESOTA NON-NATIVE TERRESTRIAL PLANTS -- An Identification Guide for Resource Managers,

by the Trails and Waterways Natural Communities Management Program, Minnesota Department of Natural Resources. 2001. 75 pp.

(Order from DNR Information Center. WWW: http://www.dnr.state.mn.us Phone: 651-296-6157.)

This nicely-designed, small-format, laminated, spiral-bound and colorful field guide is designed to guide natural resource managers in the identification of the most invasive non-native terrestrial plants in Minnesota. Thirty-five plants are treated with excellent color photos, clean descriptions of their appearance and parts, and the ecological threats they pose. Mechanical and chemical control methods are suggested for each.

NATURAL AREA WEED MANAGEMENT -- A Training Manual for Restricted Use Pesticide Applicators,

by K.A. Langeland. 2001. 46 pp.

(Order from IFAS Publications, 1-800-226-1764. $12.00 plus S/H.)

This manual contains information on herbicide application and safety in natural areas; it was developed as a study guide for persons seeking to be certified and licensed by the Florida Department of Agriculture and Consumer Services to apply pesticides in the Natural Area Weed Management category. Included are sections on herbicide characteristics; methods of herbicide application; a review of the herbicides used in natural areas; herbicide mixing, loading and application; and transportation, storage and spill management.

PHOTOSYNTHESIS - A COMPREHENSIVE TREATISE,

edited by A.S. Raghavendra. Paperback edition, with corrections, 2000. 376 pp.

(Order from Cambridge University Press, 40 West 20th Street, New York, NY 10011-4211. WWW: http://www.cup.org)

"Written by an international team of experts, this is the first advanced-level treatment which spans the broad range of the topic within a single volume..." Part I includes seven chapters on the cell and molecular biology of chloroplasts -- structure; light-harvesting complexes; photosystems I and II; pigments; chloroplast proteins; plastid genes; and electron transport. Part II includes eight chapters on physiology and biochemistry -- carbon reduction; C4 pathway; crassulacean acid metabolism; intermediate photosynthesis; starch-sucrose metabolism; photorespiration; non-carbohydrate compounds; and respiration and nitrogen metabolism. Part III is about agronomy and environmental factors -- canopy photosynthesis and crop productivity; water and salt stress; photosynthesis at low temperatures; acclimation to sun and shade; photoinhibition; effects of global climate change. Part IV includes special topics -- evolution; modelling; chlorophyll fluorescence; action of modern herbicides; and biotechnology.

LET'S GO TO WIED IL-LUNZIATA AND RIVER XLENDI, A Field Study Guide,

by S.M. Haslam and J. Borg. 2001. 46 pp.

(Order from International Tree Foundation, POB 278, Valletta, MALTA.)

This hypnotizing booklet by Sylvia Haslam and J. Borg is about the delights of studying Maltese disappeared rivers. Described are the Short Tour and the Grand Tour, day trips one might make depending on how much one might want to know about the emptied River Xlendi. Using nary a photograph (you're supposed to be there in person!), the authors describe many places of interest, pointing out the confluence, the terrace wall, the weak trickle. Asking the user of the guide to make sketches of the Grixti valley and the Gifna stream. Name the plants here. Describe the rocks of the Munxar. What color is the dirt? Imagine qabru, the freshwater crab. Did you visit the caves? Find north. The authors want us to see something important and to remember something to be done: "To protect and preserve R. Xlendi and Wied il-Lunziata."

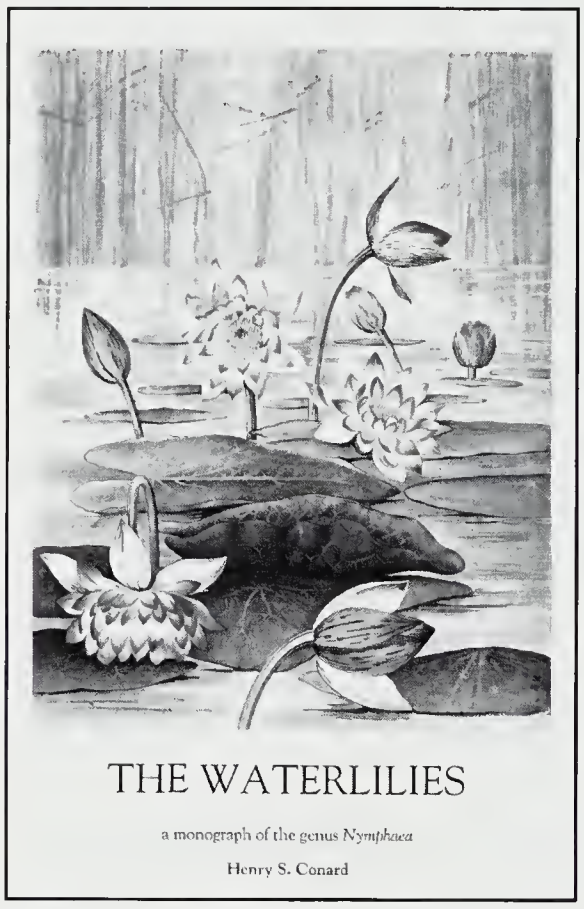
PLANTAS AQUATICA INFESTANTES DE VALAS E CANAIS,

by L. Catarino, I. Moreira, T. Ferreira and M.C. Duarte. 2001. 161 pp. (In Portuguese)

(Order this book from ISA Press, Instituto Superior de Agronomia, Tapada da Ajuda, 1349-018 Lisboa, PORTUGAL.)

This novice's handbook is about aquatic weeds in canals of Portugal; it is a well-designed tool for new managers. In several parts, the book generally describes aquatic plant classification; presents a brief history and analysis of aquatic weed infestations and problems; describes the water transport system of Portugal, including good pictures of canals, concrete channels and high-rise aquaducts and how they become infested with aquatic weeds; and pictures a number of aquatic weeds in chapters on algae, bryophytes, aquatic ferns, and about 30 higher plants. The plants are well-described, with some good color photos and a number of good line-drawings. The final chapter describes how to maintain artificial water courses,

and presents a summary of methods of aquatic weed management, from insects and fish to Portugal-approved herbicides.



THE WATERLILIES: A MONOGRAPH OF THE GENUS NYMPHAEA, by H. Conard. 1991 facsimile printing of the 1905 edition, Carnegie Institution of Washington Publication No. 4. 279 pp.

(Order from the International Water Lily & Water Gardening Society. Non-members: hardback $99, softcover $38. Members: hardback $75, softcover $30. Special limited offer for members only includes one of each for $85. All prices postage paid within US. Additional charges for shipping elsewhere. Payment via check or credit card. Contact Betsy Sakata, 1593 Ulupuni St, Kailua, Hawaii 96734, (808) 262-4072. E-mail: bsakata@hawaii.rr.com)

Even today, this important work by the 'Father of Waterlilies' is considered the foundation for serious students of Nymphaea. It brings together an enormous wealth of botanical knowledge, including the history, structure, development, and taxonomy of the genus. It also provides the most detailed waterlily descriptions found in print. This large-format book (8.5 X 11.4 in.) features a number of page-size B/W photographs and colored line drawings of leaves, flowers and seedlings. The hardbound edition comes in a box.

SEDGES: CYPERUS TO SCLERIA: The Illustrated Flora of Illinois, by R.H. Mohlenbrock. 2nd Ed. 2001. 223 pp.

(Order from Southern Illinois University Press, POB 3697, Carbondale, IL 62902-3697 E-mail: danseit@siu.edu)

This is the "second edition" of the 1976 book, with new keys. Funny thing is, the original keys are left in their first edition pages, along with the original plant descriptions and distribution maps; rather than integrate new information into the first edition, the new keys, new discoveries, nomenclatural changes and distribution additions are tacked on at the end of the book. The unsuspecting user may therefore spend a fair amount of time using the old key and old text before realizing that the "second edition" key and updated information is located in the back of the book. This book is not easy to use.

CHECKLIST OF THE VASCULAR PLANTS OF WISCONSIN, Technical Bulletin Number 192, by M.A. Wetter, T.S. Cochrane, M.R. Black, H.H. Iltis and P.E. Berry. 2001. 258 pp.

(This free publication may be ordered from Dreux Watermolen, Science Information Services, Wisconsin Department of Natural Resources, 101 S. Webster St., Box 7921, Madison, Wisconsin 53707-7921. 608-266-2621)

There are 2,366 native plant species in Wisconsin, including: 65 endangered; 57 threatened; and 171 species of special concern. Four species are believed to have been extirpated.

There are 877 introduced plant species in Wisconsin, including: 283 adventive; 185 escaped; 66 locally established; 262 naturalized; 25 persisting and spreading; and 56 rarely escaped.

This book lists all of them: Ferns and Fern Allies, Gymnosperms, Dicotyledons, Monocotyledons and Excluded Taxa. There is also an index to common names and one to scientific names. Staff of the Wisconsin State Herbarium, University of Wisconsin-Madison produced this checklist. Revised versions will be posted on the herbarium web page: http://www.wisc.edu/botany/herbarium/

MARINE PLANTS OF AUSTRALIA, by J.M. Huisman. University of Western Australia Press. 2000. 300 pp.

(Order from International Specialized Book Services, Inc., 5824 NE Hassalo St., Portland, Oregon 97213-3644. (503) 287-3093. US$75.00)

"Marine plants are more than just the drift on the beach...When living, they include some of the most beautiful and unusual plants, displaying a diversity of colours and forms at least equal to any group of land plants." Presented as a naturalist's field guide, this very well-produced, full-size, hardcover book features a couple of hundred excellent color photographs and line drawings of red, brown, green, and blue-green algae and the seagrasses. Of more than 3,000 species that occur in Australian waters, these are just the species most likely to be encountered, one or two species of each genus. Color is the only key used in the book, so users should expect to do a lot of page-flipping. Also included are sections on the history of marine botany in Australia, on uses of marine plants, and on collecting and displaying them.

AN AQUATIC PLANT IDENTIFICATION MANUAL FOR WASHINGTON'S FRESHWATER PLANTS, by K. Hamel and J. Parsons, Washington State Department of Ecology. 2001. 195 pp.

(Order from Washington Dept. of Printing, POB 798, Olympia, WA 98507, (360)753-6820. WWW: http://waprt.bizland.com/store/index.html Pub. No. 01-10-032. $27.50 plus S/H.)

Though invasive and native plant issues have become pressing for most if not all U.S. states, only a few states produce, and distribute in quantity(!), high-quality plant identification and plant management educational materials for their management agencies and their general public. Among the best are Florida, Hawaii, Minnesota, South Carolina, and, in this case, Washington.

Here is a carefully produced, glossy field manual that is all-there and easy-to-use: a very good example for other state eco-agencies to consider. 'Tis no slap-dash

effort done for the sake of saying "we have one". Of course, it helps immeasurably that the state of Washington, well-known for its Department of Ecology, actually allocates public monies for the purpose of producing and distributing relevant, needs-based, eco-education materials, monies used to pay subject-specific science writers and publication specialists.

This manual uses larger line drawings and smaller color photos, along with complete but not-so-botanical text, to treat 110 plants found in Washington lakes. Plants are grouped into categories based on similar growth forms and habitat types. Groups include shoreline plants, floating leaved rooted plants, floating mat-rooted plants, free floating plants, submersed plants, plant-like algae, aquatic moss, and "other" (sponges and bryozoans). The manual includes an illustrated glossary and instructions on how to collect and preserve aquatic plant specimens.

PLANT INVASIONS -- Species Ecology and Ecosystem Management, edited by G. Brundu, J. Brock, I. Camarda, L. Child and M. Wade. 2001. 338 pp.

(Order from Backhuys Publishers, Leiden, The Netherlands. US$ 89.00 plus S/H. WWW: http://www.backhuys.com E-mail: backhuys@backhuys.com)

This book contains papers from the 5th International Conference on the Ecology of Invasive Alien Plants, 13-16 October 1999, held in Sardinia, Italy. While the book addresses general questions on invasive plants, the book's main value is its presentation of case studies on the ecology of individual species (which is made easy by the use of a unique "index of main taxa" at the beginning of the book). Four categories of case studies include I: Species; II: Invasive plants in protected areas; III: Habitats, biotopes, regions; and IV: Invasive plant management.

More than 30 terrestrial and aquatic species are treated, including North American species which are invading South America, Central American species invading Europe, eastern Asian species invading western Asia, European species invading North America...

A GUIDE TO DESIGNING LEGAL AND INSTITUTIONAL FRAMEWORKS ON ALIEN INVASIVE SPECIES -- A Contribution to the Global Invasive Species Programme, by C. Shine, N. Williams and L. Gundling. 2000. 138 pp.

(Order from IUCN, The World Conservation Union, Publications Services Unit, 219c Huntingdon Road, Cambridge CB3 0DL, United Kingdom. WWW: http://www.iucn.org E-mail: info@books.iucn.org Environmental Policy and Law Paper No. 40. In English; available in Spanish and French.)

Although "our lives have become enriched through access to and introduction of different varieties of plant and animal species, including non-indigenous or alien species", their introduction to new ecosystems carries a heavy price--as a result, "the introduction of alien species has been recognised as one of the most serious threats to our [the world's] health, and to our ecological, social and economic well-being."

This book, two years in the making by IUCN lawyers, intends to "provide national law and policy-makers with practical information and guidance for developing or strengthening legal and institutional frameworks on alien invasive species, consistent with Article 8(h) of the Convention on Biological Diversity."

It includes "scientific considerations for legislation"; economic, social, health, ecological and genetic impacts; discussion of current international law and trade agreements, with alien species examples; relationship between international and national frameworks; measures to prevent or minimise unwanted introductions; developing legal tools for non-native species control and support of native biodiversity; and measures to promote accountability. The book also contains a table of legal instruments and provisions.

TRANSFORMATIONS OF NUTRIENTS IN NATURAL AND CONSTRUCTED WETLANDS, edited by J. Vymazal. 2001. 519 pp.

(Order from Backhuys Publishers, POB 321, 2300 AH Leiden, The Netherlands. E-mail: backhuys@backhuys.com WWW: http://www.backhuys.com US$ 148.00 plus S/H)

These are 25 refereed papers presented at the workshop, Nutrient Cycling and Retention in Natural and Constructed Wetlands III, Trebon, Czech Republic, September 14-19, 1999. Topics include nutrient cycling; carbon transformations; retention mechanisms and capacity; use for wastewater; nutrient retention by macrophytes; physiological responses of macrophytes; water cycles; budgets; evapotranspiration; and functional assessment of wetlands.

LES PRINCIPAUX VÉGÉTAUX AQUATIQUES DU SUD-OUEST DE LA FRANCE, by A. Fare, A. Dutartre, and J.-P. Rebillard. Agence de l'Eau Adour Garonne. 2001. 190 pp. (In French)

(Order this free publication from the French Water Agency of Adour Garonne: Marie Martine Galaup, Agence de l'Eau Adour Garonne, 90 Rue de Férétra, 31078 Toulouse Cedex 4, FRANCE. E-mail: marie-martine.galaup@eau-adour-garonne.fr)

This handy-size spiral-bound ID book, in French, describes 134, and pictures nearly 100, of the aquatic and wetland plants of southwest France. It is in alphabetical order according to species, in 3 parts: les hydrophytes, les amphibies, et les hélo-phytes. Each plant is generally described, and then very briefly treated in terms of habitat, inflorescence, and fruit, as well as special identifying characteristics. The book includes a glossaire. The full-page, color, pretty-good photos are a welcome relief from so many other ID books having too-many too-small photos.

Publishers, authors, agency managers ...

To submit items for review in the **Books/Reports** section of **AQUAPHYTE**, please send a review copy to the editors' attention. Accepted items will be reviewed in the newsletter and on our website at http://plants.ifas.ufl.edu/books.html Also, annotated citations will be added to the **APIRS** database of scientific literature on aquatic, wetland and invasive plants.

Continued from Page 1

After a lower federal district court concluded that it was not necessary to obtain an NPDES permit for treatment with acrolein, Headwaters, Inc. et al. appealed the case to the 9th Circuit Court of Appeals. The 9th Circuit Court has jurisdiction over Alaska, Washington, Oregon, Idaho, Montana, Nevada, Arizona, California, Hawaii, and Guam. These nine states and Guam are bound by any decisions made by the 9th Circuit Court. On March 12, 2001, this court reversed the lower court's ruling and found that "the registration and labeling of Magnacide H under the Federal Insecticide, Fungicide, Rodenticide Act (FIFRA) does not preclude the need for a permit under the CWA." The Talent decision was not appealed to the Supreme Court.
[See http://www.owrc.org/litigation/tidopinion.htm]

Washington's Response to the Talent Irrigation District Decision

The state of Washington's Assistant Attorney General to the Department of Ecology (Ecology) interpreted the Talent court decision to mean that the application of *any* aquatic pesticide to Washington waterbodies requires coverage under an NPDES permit. This interpretation was partially in response to the threat of lawsuits from environmental groups if an NPDES permit program was not put in place. Pesticides are applied to waters of the state for the control of mosquitoes, burrowing shrimp, some fish species, noxious submersed weeds (Eurasian watermilfoil, hydrilla), noxious emergent weeds (purple loosestrife, spartina), nuisance native aquatic plants, and algae.

Washington, Oregon, California, Montana, Nevada, and Hawaii have been delegated authority from the Environmental Protection Agency (EPA) to develop and administer NPDES permit programs. Idaho, Alaska, and Arizona obtain their NPDES permit coverage from EPA. Ecology administers Washington's NPDES programs for industrial waste discharges, sewage treatment, municipal and industrial stormwater, and dairy waste. However, aquatic pesticide application does not fit neatly into state and federal laws that regulate point source pollutant discharge to water. To date EPA has provided little guidance or direction to the affected states on how to interpret the court decision or how to develop an aquatic pesticide NPDES permitting program.

The March court decision did not allow Washington enough time to develop an aquatic pesticide NPDES program for the 2001-treatment season. Although Ecology's existing aquatic pesticide permitting program was not an NPDES program, Ecology continued to issue orders (permits) under this program for 2001. Applicants were informed that these permits were not NPDES permits and that they could be subject to third party lawsuits as a result of the Talent court decision. Willapa Bay oyster growers (who treat oyster beds for burrowing shrimp) were threatened with a third party lawsuit because they didn't have NPDES permit coverage. They subsequently chose not to treat in 2001, permanently losing some oyster beds by this action. All state-funded and most locally funded herbicide applications to control noxious aquatic weeds did not take place. Many irrigation districts asked for coverage under Ecology's existing program, something they had not done before.

For most NPDES permits, people are trying to dispose of unwanted wastes into a waterbody. In the case of aquatic pesticides, people are deliberately introducing a toxic compound into a waterbody to improve beneficial uses. Ecology is currently developing seven general NPDES permits for aquatic pesticide application to Washington waters in 2002 and beyond. Permit holders will include: irrigation districts; mosquito districts; Departments of Fish and Wildlife; Agriculture; and Transportation; oyster growers; and aquatic herbicide applicators. Advisory committees have been formed to provide oversight to each general permit and informational meetings have been held. Each advisory committee is expected to meet twice to provide input into the draft permit before it is made available for public review. Because of public and internal review processes, Ecology doesn't anticipate having final permits in place until late spring or early summer of 2002.

While most aquatic pesticide applicators are accustomed to being regulated by Ecology, there will be some changes under the new program. Because of state law, fees will be charged to cover the administration of the NPDES permits. Although the amounts are as yet unknown, in some cases, permit fees could be substantial. Some type of limited monitoring of the receiving waters, most likely for pesticide concentrations, will also be required. Requirements already in place under the superceded permit program, such as public notification and Endangered Species Act protections, will be incorporated into the NPDES permits where appropriate. The NPDES permits will be at least as, or more, protective of the aquatic environment than the superseded aquatic pesticide permitting program.

There has been great interest in Washington's aquatic pesticide NPDES program from affected parties and environmental groups. Washington interpreted the Talent decision to mean that all aquatic pesticide applications must be regulated under an NPDES program. Other western states may have made different interpretations, although California has developed a general NPDES permit for aquatic pesticide use. Several environmental groups indicated to Ecology that had Washington continued to allow aquatic pesticide applications under the existing program we would have been challenged in court with the Talent Irrigation District decision forming the basis for that legal challenge. Moving forward with the development of an NPDES program for aquatic pesticides is a necessary action for Washington.

Editor's note: The industry response to the Ninth Circuit Court's Ruling has included the formation and funding of the Aquatic Pesticide Coalition (APC) by a group of agricultural producers, irrigation district managers, aquatic pesticide manufacturers, mosquito control interests and companies in the lake management industry. The APC hopes to help develop a solution to the problem. They have hired attorneys experienced with the Clean Water Act and have presented a Position and Background paper to the EPA. An industry newsletter, *AquaTechnex e-news*, makes the following observations: "Western irrigated agriculture depends on approximately 16,000 miles of irrigation canals and 37,000 miles of laterals. In 1997, irrigated Western cropland produced $22

Continued from Page 10

billion in sales (as compared to national crop sales in 1997 of approximately $100 billion). . . .This ruling has paralyzed necessary aquatic plant management operations in the western United States. . . . . U.S. EPA has had long-standing policy and guidance in place that specifies under what circumstances an NPDES permit is needed to discharge pesticides into the waters of the U.S. from an industrial facility. NPDES permits have not been required for the application of aquatic pesticides to water in accordance with product labels under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). Further, EPA has never instituted an enforcement action against any such person for failing to have an NPDES permit under these circumstances. . . . The imposition of NPDES permits on the use of aquatic herbicides . . . could have the perverse effect of impairing water quality through the negative consequences of aquatic invasive plant infestations."

To contact the Aquatic Pesticide Coalition, write to 1156 15th Street NW, Suite 400, Washington, DC 20005. *KB*

New Regional Scientific Journal - *SOUTHEASTERN NATURALIST*

Southeastern Naturalist announces a new interdisciplinary regional scientific journal with its first call for papers and subscribers. The quarterly journal is intended to serve as a standard scientific reference resource for the southeastern United States. Manuscripts are solicited in the general categories of original research articles; research summaries and general interest articles; and field observations and notes. Manuscripts may focus on terrestrial, freshwater, and marine organisms, and their habitats. Subject areas include but are not limited to field ecology, biology, behavior, biogeography, wildlife and fisheries management, taxonomy, evolution, anatomy, physiology, geology, and related fields. Manuscripts on genetics, molecular biology, archaeology, and anthropology, etc., are welcome if they provide natural history insights that are of strategic interest to field scientists. Manuscripts may be submitted by anyone who has a serious interest in natural history, including university and college faculty members and their students, researchers, field biologists, professional and amateur naturalists, and writers.

The *Southeastern Naturalist* has no page charges, but does encourage contributions towards printing costs, especially when allowed by grants, contracts, or reprint budgets of the authors. The Humboldt Field Research Institute is a nonprofit corporation of the State of Maine.

Subscription rate per year for individuals at US addresses, $40 (students, $30.); institutions at US addresses, $60; Canadian addresses, add $4; other addresses outside the US, add $8. Subscription exchanges are considered. Contact the Humboldt Field Research Institute, PO Box 9, Steuben, ME 04680-0009; Telephone 207-546-2821; FAX 207-546-3042; E-mail: humboldt@loa.com WWW: http://maine.maine.edu/~eaglhill

http://plants.ifas.ufl.edu

The **Center for Aquatic and Invasive Plants** web site now has more than 6,000 pages (including photographs) about aquatic plants and invasive plants. Thousands more pages are in process.

Here are some of our web places of interest:

http://plants.ifas.ufl.edu/photos.html -- original photos and basic information about 237 plant species

http://plants.ifas.ufl.edu/seagrant/aquinv.html -- very detailed information taken from the recent scientific literature about 24 aquatic/wetland invasive plants, including photos and line drawings. This part of the web site was developed as part of a grant from the National Sea Grant, Invasive Aquatic Species program.

http://plants.ifas.ufl.edu/terinv.html -- very detailed information about 12 terrestrial invasive plants. This part of the web site was developed as part of a grant from the St. Johns River Water Management District which manages thousands of acres of Florida's public lands.

http://plants.ifas.ufl.edu/drawlist.html -- 154 original line drawings of plants in the U.S., native and non-native.

http://plants.ifas.ufl.edu/seagrant/invlists.html -- a national map that links to every state's lists of prohibited aquatic, terrestrial and agricultural weeds, and plants of special concern.

http://plants.ifas.ufl.edu/identif.html -- a PDF version of the book Identification & Biology of Non-Native Plants in Florida's Natural Areas, edited by K.A. Langeland and K. Craddock Burks. Individual pages of this book may be downloaded from relevant plants listed at http://plants.ifas.ufl.edu/photos.html

http://plants.ifas.ufl.edu/manuals.html -- here are names of a couple of hundred plant identification manuals and textbooks, arranged alphabetically and according to geography.

http://plants.ifas.ufl.edu/glossary.html -- this searchable glossary of every botanical term known to Dr. David Sutton is linked to by a number of encyclopedic web sites.

http://plants.ifas.ufl.edu/gallery2.html -- here are photographs and descriptions of a number of Florida sites, public and private, that feature the state's greatest feature: water. See invasive plants at Kennedy Space Center and Merritt Island National Wildlife Refuge.

FROM THE DATABASE

Here is a sampling of the research articles, books and reports which have been entered into the aquatic, wetland and invasive plant database since Summer 2001.

The database contains more than 55,000 citations. To receive free bibliographies on specific plants and/or subjects, contact APIRS using the information on the back page or use the database online at http://plants.ifas.ufl.edu/

To obtain articles, contact your nearest state or university library.

Ailstock, M.S., Norman, C.M., Bushmann, P.J.
Common reed *Phragmites australis*: control and effects upon biodiversity in freshwater nontidal wetlands.
RESTORATION ECOL. 9(1):49-59. 2001.

Al-Owaimer, A.N.
Effect of dietary halophyte *Salicornia bigelovii* Torr. on carcass characteristics, minerals, fatty acids and amino acids profile of camel meat.
J. APP. ANIM. RES. 18(2):185-192. 2000.

Amiaud, B., Bonis, A., Bouzillé, J.-B.
Conditions de germination et rôle des herbivores dans la dispersion et le recrutement d'une espece clonale: *Juncus gerardi* Lois.
CAN. J. BOT. 78(11):1430-1439. (IN FRENCH; ENGLISH SUMMARY) 2000.

Angradi, T.R., Hagan, S.M., Able, K.W.
Vegetation type and the intertidal macroinvertebrate fauna of a brackish marsh: *Phragmites* vs *Spartina*.
WETLANDS 21(1):75-92. 2001.

Antunes, A.P.M., Watkins, G.M., Duncan, J.R.
Batch studies on the removal of gold (III) from aqueous solution by *Azolla filiculoides*.
BIOTECHNOL. LETTERS 23(4):249-251. 2001.

Aziz, A., Sharmin, S.
Growth and nitrogenase activity of *Azolla pinnata* var. *pinnata* R. Brown as affected by some environmental factors.
BANGLADESH J. BOT. 29(2):125-131. 2000.

Baattrup-Pedersen, A., Riis, T., Hansen, H.O., Friberg, N.
Restoration of a Danish headwater stream: short-term changes in plant species abundance and composition.
AQUATIC CONSERV.: MARINE. & FRESHWATER ECOSYSTEMS 10:13-23. 2000.

Baskin, C.C., Milberg, P., Andersson, L., Baskin, J.M.
Seed dormancy-breaking and germination requirements of *Drosera anglica*, an insectivorous species of the northern hemisphere.
ACTA OECOLOGIA 22(1):1-8. 2001.

Basu, B.K., Kalff, J., Pinel-Alloul, B.
The influence of macrophyte beds on plankton communities and their export from fluvial lakes in the St. Lawrence River.
FRESHWATER BIOL. 45(4):373-382. 2000.

Behcet, L., Ozgokce, F.
The vegetation of some lakes in East Anatolia (Turkey).
BULL. PURE AND APPLIED SCI. 17B(1):1-15. 1998.

Bennion, H., Monteith, D., Appleby, P.
Temporal and geographical variation in lake trophic status in the English Lake District: evidence from (sub)fossil diatoms and aquatic macrophytes.
FRESHWATER BIOL. 45(4):394-412. 2000.

Best, E.P.H., Boyd, W.A.
Valla (Version 1.0): a simulation model for growth of American wildcelery.
U.S. ARMY ENGINEER RES. DEVELOPMENT CTR., VICKSBURG, MS, ERDC/EL SR-01-1, 25 PP. 2001.

Broussaud-Le Strat, F.
Historique et bibliographie du genre *Utricularia*.
J. BOT. SOC. BOT. FRANCE 7:83-87. (IN FRENCH) 1998.

Canfield, D.E., Bachmann, R.W., Hoyer, M.V.
A management alternative for Lake Apopka.
LAKE AND RESERVOIR MANAGE. 16(3):205-221. 2000.

Casati, P., Lara, M.V., Andreo, C.S.
Induction of a C4-like mechanism of CO_2 fixation in *Egeria densa*, a submersed aquatic species.
PLANT PHYSIOL. 123(4):1611-1621. 2000.

Center, T.D., Van, T.K., Rayachhetry, M., Buckingham, G.R., et al
Field colonization of the Melaleuca snout beetle (*Oxyops vitiosa*) in South Florida.
BIOLOGICAL CONTROL 19(2):112-123. 2000.

Cieslak, E., Ilnicki, T., Flis, M.
Cytotaxonomical studies on the *Caltha palustris* complex (Ranunculaceae) in Poland. Preliminary report.
ACTA BIOLOGICA CRACOVIENSIA 42(1):121-129. 2000.

Clark, D.L., Wilson, M.V.
Fire, mowing, and hand-removal of woody species in restoring a native wetland prairie in the Willamette Valley of Oregon.
WETLANDS 21(1):135-144. 2001.

Conway, V.M.
Growth rates and water loss in *Cladium mariscus* R. Br.
ANNALS OF BOTANY 4(13):151-164. 1940.

Cordes, K.B., Mehra, A., Farago, M.E., Banerjee, D.K.
Uptake of Cd, Cu, Ni and Zn by the water hyacinth, *Eichhornia crassipes* (Mart.) Solms from pulverised fuel ash (PFA) leachates and slurries.
ENVIRON. GEOCHEM. HEALTH 22(4):297-316. 2000.

Dalby, R.
Three bee plants: purple loosestrife, vetch, and safflower.
AMERICAN BEE J. 141(1):53-55. 2001.

Davies, C.M., Sakadevan, K., Bavor, H.J.
Removal of stormwater-associated nutrients and bacteria in constructed wetland and water pollution control pond systems.
IN: TRANSFORMATIONS OF NUTRIENTS IN NATURAL AND CONSTRUCTED WETLANDS, ED. J. VYMAZAL, BACKHUYS PUBL., LEIDEN, THE NETHERLANDS, PP. 483-495. 2001.

Deonier, D.L.
North American ephydrid habitat types and probable ephydrid inhabitants (Diptera: Ephydridae).
D.L. DEONIER, PUBL., PITTSBURG, KS, 12 PP. 2000.

Egan, T.P., Ungar, I.A.
Similarity between seed banks and above-ground vegetation along a salinity gradient.
J. VEG. SCI. 11:189-194. 2000.

El-Kahloun, M., Boeye, D., Verhagen, B., Van Haesebroeck, V.
A comparison of the nutrient status of *Molinia caerulea* and neighbouring vegetation in a rich fen.
BELGIAN J. BOT. 133(1-2):91-102. 2000.

Faubert, J.
Les Potamogetonaceae du Québec méridional: identification et répartition.
CANADIAN FIELD-NATURALIST 114(3):359-380. 2000.

Fischer, M., Husi, R., Prati, D., Peintinger, M., et al
RAPD variation among and within small and large populations of the rare clonal plant *Ranunculus reptans* (Ranunculaceae).
AMER. J. BOT. 87(8):1128-1137. 2000.

Fourqurean, J.W., Willsie, A., Rose, C.D., Rutten, L.M.
Spatial and temporal pattern in seagrass community composition and productivity in south Florida.
MARINE BIOLOGY 138(2):341-354. 2001.

Frankl, R., Schmeidl, H.
Vegetation change in a south German raised bog: ecosystem engineering by plant species, vegetation switch or ecosystem level feedback mechanisms?
FLORA 195(3):267-276. 2000.

Gabrey, S.W., Afton, A.D.
Effects of winter marsh burning on abundance and nesting activity of Louisiana seaside sparrows in the Gulf Coast Chenier Plain.
WILSON BULL. 112(3):365-372. 2000.

Gao, J., Garrison, A.W., Hoehamer, C., Mazur, C.S., et al
Uptake and phytotransformation of organophosphorus pesticides by axenically cultivated aquatic plants.
J. AGRIC. FOOD CHEM. 48(12):6114-6120. 2000.

Garcia-Hernandez, J., Glenn, E.P., Artiola, J., Baumgartner, D.J.
Bioaccumulation of selenium (Se) in the Cienega de Santa Clara Wetland, Sonora, Mexico.
ECOTOXICOL. ENVIRON. SAFETY 46(3):298-304. 2000.

Gomez Mendez, C.E.
Evaluación de maleza acuática con relación a parámetros químicos de agua y sedimento en el DR-086 soto la marina, mediante sig y bioestadística.
THESIS, UNIDAD ACADÉMICA MULTIDISCIPLINARIA, AGRONOMÍA Y CIENCIAS, UNIVERSIDAD AUTÓNOMA DE TAMAULIPAS, MÉXICO, 121 PP. (IN SPANISH; ENGLISH SUMMARY) 2000.

Grabas, G.P., Laverty, T.M.
The effect of purple loosestrife (*Lythrum salicaria* L.; Lythraceae) on the pollination and reproductive success of sympatric co-flowering wetland plants.
ECOSCI. 6(2):230-242. 1999.

Grodowitz, M.J., Freedman, J.E., Jones, H., Jeffers, L., et al
Status of waterhyacinth/hydrilla infestations and associated biological control agents in Lower Rio Grande Valley cooperating Irrigation Districts.
ERDC/EL SR-00-11, U.S. ARMY CORPS OF ENGINEERS ENVIRONMENTAL LAB., VICKSBURG, MS, 33 PP. 2000.

Hauxwell, J., Cebrian, J., Furlong, C., Valiela, I.
Macroalgal canopies contribute to eelgrass (*Zostera marina*) decline in temperate estuarine ecosystems.
ECOLOGY 82(4):1007-1022. 2001.

Haynes, D., Ralph, P., Pranges, J., Dennison, B.
The impact of the herbicide diuron on photosynthesis in three species of tropical seagrass.
MAR. POLL. BULL. 41(7-12):288-293. 2000.

Hesler, L.S., Oraze, M.J., Grigarick, A.A., Palrang, A.T.
Numbers of rice water weevil larvae (Coleoptera: Curculionidae) and rice plant growth in relation to adult infestation levels and broadleaf herbicide applications.
J. AGRIC. URBAN ENTOMOL. 17(2):99-108. 2000.

Hildebrandt, U., Janetta, K., Ouziad, F., Renne, B., et al
Arbuscular mycorrhizal colonization of halophytes in central European salt marshes.
MYCORRHIZA 10(4):175-183. 2001.

Hill, N.M., Boates, J.S., Elderkin, M.F.
Low catchment area lakes: new records for rare coastal plain shrubs and *Utricularia* species in Nova Scotia.
RHODORA 102(912):518-522. 2000.

Hollingsworth, M.L.
Evidence for massive clonal growth in the invasive weed *Fallopia japonica* (Japanese knotweed).
BOTANICAL J. LINNEAN SOC. 133(4):463-472. 2000.

Hood, W.G., Naiman, R.J.
Vulnerability of riparian zones to invasion by exotic vascular plants.
PLANT ECOL. 148(1):105-114. 2000.

Humburg, D.D., Bataille, K., Helmers, D.L., Brunet, D.A.
Evaluation of seasonal habitat use by waterbirds on the Missouri River floodplain.
FINAL REPT., RESEARCH AND SURVEY PROJECTS, MISSOURI DEPT. CONSERVATION, COLUMBIA, 130 PP.

Hwang, Y.-H., Liou, C.-F., Weng, I.-S.
Nutrient dynamics of two aquatic angiosperms in an alpine lake, Taiwan.
BOT. BULL. ACAD. SIN. 41(4):275-282. 2000.

Iida, S., Kadono, Y.
Population genetics structure of *Potamogeton anguillanus* in Lake Shinji, Japan.
LIMNOL. 2:51-53. 2001.

James, W.F., Barko, J.W., Eakin, H.L.
Direct and indirect impacts of submersed aquatic vegetation on the nutrient budget of an urban oxbow lake.
APCRP TECH. NOTES COLL., U.S. ARMY ENGINEER RES. DEVELOPMENT CTR., VICKSBURG, MS, ERDC TN-APCRP-EA-02, 11 PP. 2001.

Karjalainen, H., Stefansdottir, G., Tuominen, L., Kairesalo, T.
Do submersed plants enhance microbial activity in sediment?
AQUATIC BOT. 69(1):1-13. 2001.

Karunaratne, S., Asaeda, T.
Verification of a mathematical growth model of *Phragmites australis* using field data from two Scottish lochs.
FOLIA GEOBOTANICA 35:419-432. 2000.

Kathiresan, R.M., Ramah, K.
Impact of weed management in rice-fish farming systems.
INDIAN J. WEED SCI. 32(1-2):39-43. 2000.

Kendle, A.D., Rose, J.E.
The aliens have landed! What are the justifications for 'native only' policies in landscape plantings?
LANDSCAPE AND URBAN PLANNING 47(1-2):19-31. 2000.

Kilbride, K.M., Paveglio, F.L.
Long-term fate of glyphosate associated with repeated Rodeo applications to

control smooth cordgrass (*Spartina alterniflora*) in Willapa Bay, Washington.
ARCH. ENVIRON. CONTAM. TOXICOL. 40(2):179-183. 2001.

Knight, R.L., Payne, V.W.E., Borer, R.E., Clarke, R.A., et al
Constructed wetlands for livestock wastewater management.
ECOLOGICAL ENGIN. 15:41-55. 2000.

Knight, R.L., Walton, W.E., O'Meara, G., Reisen, W.K., et al
Design strategies for effective mosquito control in constructed treatment wetlands.
IN: 7TH INTER. CONF. WETLAND SYSTEMS FOR WATER POLLUTION CONTROL, VOL. ONE, EDS K.R. REDDY AND R.H. KADLEC, INST. FOOD AND AGRIC. SCI., UNIV. FLORIDA, GAINESVILLE, NOV. 11-16, LAKE BUENA VISTA, FL., PP. 425-440. 2000.

Larsen, L., Jorgensen, C., Aamand, J.
Potential mineralization of four herbicides in a ground water-fed wetland area.
J. ENVIRON. QUAL. 30(1):24-30. 2001.

Lewis, M.A., Weber, D.E., Stanley, R.S., Moore, J.C.
The relevance of rooted vascular plants as indicators of estuarine sediment quality.
ARCH. ENVIRON. CONTAM. TOXICOL. 40(1):25-34. 2001.

Lowe, E.F., Battoe, L.E., Coveney, M., Stites, D.
Setting water quality goals for restoration of Lake Apopka: inferring past conditions.
LAKE AND RESERVOIR MANAGE. 15(2):103-120. 1999.

Lynn, D.E., Waldren, S.
Morphological variation in populations of *Ranunculus repens* from the temporary limestone lakes (turloughs) in the west of Ireland.
ANNALS OF BOT. 87(1):9-17. 2001.

Madsen, J.D., Getsinger, K.D., Stewart, R.M., Skogerboe, J.G., et al
Evaluation of transparency and light attenuation by Aquashade.
LAKE AND RESERVOIR MANAGE. 15(2):142-147. 1999.

Miller, S.P., Sharitz, R.R.
Manipulation of flooding and arbuscular mycorrhiza formation influences growth and nutrition of two semiaquatic grass species.
FUNCTIONAL ECOL. 14(6):738-748. 2000.

Morison, J.I.L., Piedade, M.T.F., Muller, E., Long, S.P., et al
Very high productivity of the C4 aquatic grass *Echinochloa polystachya* in the Amazon floodplain confirmed by net ecosystem CO_2 flux measurements.
OECOLOGIA 125(3):400-411. 2000.

Naugle, D.E., Johnson, R.R., Estey, M.E., Higgins, K.F.
A landscape approach to conserving wetland bird habitat in the prairie pothole region of eastern South Dakota.
WETLANDS 21(1):1-17. 2001.

Nealson, P.A., Gregory, J.
Hydroacoustic differentiation of adult Atlantic salmon and aquatic macrophytes in the River Wye, Wales.
AQUATIC LIVING RESOURCES 13(5):331-339. 2000.

Notestein, S.K.
Physical, chemical, and vegetative characteristics of the Chassahowitzka River.
MS THESIS, UNIV. FLORIDA, GAINESVILLE, 85 PP. 2001.

Ogden, R.W.
Modern and historical variation in aquatic macrophyte cover of billabongs associated with catchment development.
REGUL. RIVERS: RES. AND MANAGE. 16(5):497-512. 2000.

Olckers, T.
Biology, host specificity and risk assessment of *Gargaphia decoris*, the first agent to be released in South Africa for the biological control of the invasive tree *Solanum mauritianum*.
BIOCONTROL 45(3):373-388. 2000.

Olivares, E., Colonnello, G.
Salinity gradient in the Manamo River, a dammed distributary of the Orinoco Delta, and its influence on the presence of *Eichhornia crassipes* and *Paspalum repens*.
INTERCIENCIA 25(5):242-248. 2000.

Petersen, R.L., Faust, A., Nagawa, J., Thomas, C., et al
Foreign mosquito survivorship in the pitcher plant *Sarracenia purpurea* - the role of the pitcher-plant midge *Metriocnemus knabi*.
HYDROBIOLOGIA 439(1-3):13-19. 2000.

Plasencia Fraga, J., Hurtado, A., Chateloin, T.
Cambios en la composición florística de la Laguna del Tesoro, Cuba.
ACTA BOTANICA CUBANA 131:1-7. (IN SPANISH; ENGLISH SUMMARY) 1999.

Pokorny, P., Jankovska, V.
Long-term vegetation dynamics and the infilling process of a former lake (Svarcenberk, Czech Republic).
FOLIA GEOGOTANICA 35(4):433-457. 2000.

Powers, K.D., Noble, R.E., Chabreck, R.H.
Seed distribution by waterfowl in southwestern Louisiana.
J. WILDL. MANAGE. 42(3):598-605. 1978.

Quayyum, H.A., Mallik, A.U., Leach, D.M., Gottardo, C.
Growth inhibitory effects of nutgrass (*Cyperus rotundus*) on rice (*Oryza sativa*) seedlings.
J. CHEM. ECOL. 26(9):2221-2231. 2000.

Raspopov, I.M., Andronikova, I.N., Slepukhina, T.D., Raspletina,G.F., et al
Land-water ecotones of the Great Lakes.
SYNTEZ PUBLISHING GROUP, ST. PETERSBURG, RUSSIA, 54 PP. (IN RUSSIAN) 1998.

Reichard, S.
The search for patterns that enable prediction of invasion.
IN: WEED RISK ASSESSMENT, EDS. R.H. GROVES, F.D. PANETTA, ET AL, CSIRO PUBLISHING, AUSTRALIA, PP. 10-19. 2001.

Reusch, T.B.H.
New markers - old questions: population genetics of seagrasses.
MAR. ECOL. PROG. SER. 211:261-274. 2001.

Ritter, N.P.
Biodiversity and phytogeography of Bolivia's wetland flora.
DISSERTATION, UNIVERSITY OF NEW HAMPSHIRE, DURHAM, 399 PP. 1992.

Rochefort, L.
Sphagnum - a keystone genus in habitat restoration.
BRYOLOGIST 103(3):503-508. 2000.

Rodgers, J.A., Smith, H.T., Thayer, D.D.
Integrating nonindigenous aquatic plant control with protection of snail kite nests in Florida.
ENVIRON. MANAGE. 28(1):31-37. 2001.

Rubtzoff, P.
A phytogeographical analysis of the Pitkin Marsh.
WASMANN J. BIOL. 11(2):129-219. 1953.

Russell, G.E.G., Mitchell, D.S.
Common aquatic plants on Rhodesian

pans and lakes.
RHODESIA AGRIC. J. 73(1):13-17. 1976.

Sályi, G., Csaba, G., Gaálné, D.E., Orosz, E., et al
Effect of the cyanide and heavy metal pollution passed in River Szamos and Tisza on the aquatic flora and fauna with special regard to the fish.
MAGYAR ALLATORVOSOK LAPJA 122(8):493-500. (IN HUNGARIAN; ENGLISH SUMMARY) 2000.

Scarton, F., Day, J.W., Rismondo, A.
Above and belowground production of *Phragmites australis* in the Po Delta, Italy.
BOLL. MUS. CIV. ST. NAT. VENEZIE 49:213-222. 1999.

Schorer, A., Schneider, S., Melzer, A.
The importance of submerged macrophytes as indicators for the nutrient concentration in a small stream (Rotbach, Bavaria).
LIMNOLOGICA 30:351-358. 2000.

Schussler, E.E., Longstreth, D.J.
Changes in cell structure during the formation of root aerenchyma in *Sagittaria lancifolia* (Alismataceae).
AMER. J. BOT. 87(1):12-19. 2000.

Shabana, Y.M., Elwakil, M.A., Charudattan, R.
Effect of media, light and pH on growth and spore production by *Alternaria eichhorniae*, a mycoherbicide agent for waterhyacinth.
J. PLANT DISEASES AND PROTECTION 107(6):617-626. 2000.

Sharma, K.P., Sharma, K., Bhardwaj, S.M., Chaturvedi, R.K., et al
Environment impact assessment of textile printing industries in Sanganer, Jaipur: a case study.
J. INDIAN BOT. SOC. 78:71-85. 1999.

Shearer, J.F.
Dose response studies of *Mycoleptodiscus terrestris* formulations on *Hydrilla verticillata*.
APCRP TECH. NOTES COLL., U.S. ARMY ENGINEER RES. DEVELOPMENT CTR., VICKSBURG, MS, TN-APCRP-BC-026, 6 PP. 2001.

Shilov, M.P., Mikhailova, T.N.
Distribution of the water chestnut [*Trapa natans* (L.S.L.)] in the bottom-land reservoirs of the Vladimir region and some of their hydrochemical characteristics.
HYDROBIOL. J. 7(3):48-52. 1971.

Shrestha, P., Janauer, G.A.
Species diversity of aquatic macrophytes in Lake Phewa and Lake Rupa of Pokhara Valley, Nepal.
INTERN. J. ECOL. ENVIRON. SCI. 26:269-280. 2000.

Sorrell, B.K., Mendelssohn, I.A., McKee, K.L., Woods, R.A.
Ecophysiology of wetland plant roots: a modelling comparison of aeration in relation to species distribution.
ANNALS OF BOTANY 86(3):675-685. 2000.

Srivastava,P.K., Pandey,G.C.
Effect of fertilizer effluent on total chlorophyll content and biomass of some aquatic macrophytes.
J. ECOTOXICOL. ENVIRON. MONIT. 11(2):123-127. 1999.

Stocker, R.K.
Commercial use, physical distribution, and invasiveness description: three reasons why Florida still struggles with invasive plants.
IN: WEED RISK ASSESSMENT, EDS. R.H. GROVES, F.D. PANETTA, ET AL, CSIRO PUBLISHING, AUSTRALIA, PP. 182-185. 2001.

Strand, J.A.
Submerged macrophytes in shallow eutrophic lakes - regulating factors and ecosystem effects.
DISSERTATION, LUND UNIVERSITY, DEPT. ECOLOGY, LIMNOLOGY, LUND, SWEDEN. 1999.

Tamura, S., Kuramochi, H., Ishizawa, K.
Involvement of calcium ion in the stimulated shoot elongation of arrowhead tubers under anaerobic conditions.
PLANT CELL PHYSIOL. 42(7):717-722. 2001

Tarasevich, V.F.
Palynological evidence of the position of the Lemnaceae family in the system of flowering plants.
BOTANICHESKII ZHURNAL (J. BOTANY) 75(7):959-965 (IN RUSSIAN) 1990.

Thorne, J.F., Eisman, R.
Cattle grazing helps to restore bog turtle habitat (Pennsylvania).
ECOLOGICAL RESTORATION 19(1):54-55. 2001.

Tomas, W.M., Salis, S.M.
Diet of the marsh deer (*Blastocerus dichotomus*) in the Pantanal wetland, Brazil.
STUD. NEOTROP. FAUNA ENVIRON. 35(3):165-172. 2000.

Tooth, S., Nanson, G.C.
Anabranching rivers on the northern plains of arid central Australia.
GEOMORPHOL. 29:211-233. 1999.

Tourn, G.M., Menvielle, M.F., Scopel, A.L., Pidal, B.
Clonal strategies of a woody weed: *Melia azedarach*.
PLANT AND SOIL 217:111-117. 1999.

Unmuth, J.M.L., Lillie, R.A., Dreikosen, D.S.
Influence of dense growth of Eurasian watermilfoil on lake water temperature and dissolved oxygen.
J. FRESHWATER ECOL. 15(4):497-503. 2000.

Vymazal, J.
Types of constructed wetlands for wastewater treatment: their potential for nutrient removal.
IN: TRANSFORMATIONS OF NUTRIENTS IN NATURAL AND CONSTRUCTED WETLANDS, ED. J. VYMAZAL, BACKHUYS PUBL., LEIDEN, THE NETHERLANDS, PP. 1-93. 2001.

West, J.M., Zedler, J.B.
Marsh-creek connectivity: fish use of a tidal salt marsh in southern California.
ESTUARIES 23(5):699-710. 2000.

Williams, P.A., Nicol, E., Newfield, M.
Assessing the risk to indigenous biota of plant taxa new to New Zealand.
IN: WEED RISK ASSESSMENT, EDS. R.H. GROVES, F.D. PANETTA, ET AL, CSIRO PUBLISHING, AUSTRALIA, PP. 110-116. 2001.

Wilson, P.C., Whitwell, T., Klaine, S.J.
Metalaxyl and simazine toxicity to and uptake by *Typha latifolia*.
ARCH. ENVIRON. CONTAM. TOXICOL. 39(3):282-288. 2000.

Wolterbeek, H.T., Van Der Meer, A.J.G.M., Dielemans, U.
On the variability of plant bio-concentration factors (BCF) of environmental radionuclides: a case study on the effects of surface film and free space on the interpretation of $^{99m}TcO_4^-$ sorption in duckweed.
SCI. TOTAL ENVIRON. 257(2-3):177-190. 2000.

Wood, S.L., Wheeler, E.F., Berghage, R.D.
Removal of dimethyl disulfide and p-cresol from swine facility wastewater using constructed subsurface-flow wetlands.
TRANS. AMER. SOC. AGRIC. ENGIN. (ASAE) 43(4):973-979. 2000.

MEETINGS

AQUATIC WEED CONTROL, AQUATIC PLANT CULTURE AND REVEGETATION SHORT COURSE.
May 19-24, 2002. Fort Lauderdale, Florida.

This is THE annual short course as devised by Drs. Vernon Vandiver and David Sutton of the Ft. Lauderdale branch of the University of Florida. This year's short course will feature a training session on the Natural Area Pest Control Pesticide Applicator Category, a new pest management category in Florida. Otherwise, attendees may earn CEUs while learning (or re-learning) how to control weeds in aquatic situations and along rights-of-way; how to operate and calibrate pesticide application equipment; how to identify aquatic and wetland plants; how to culture aquatic plants; and how to establish and maintain wetland mitigation areas.

Contact: Beth Miller-Tipton, University of Florida, Institute of Food and Agricultural Sciences, PO Box 110750, Gainesville, FL 32611-0750, PHONE: (352) 392-5930 / FAX: (352) 392-9734; E-mail: bmiller-tipton@mail.ifas.ufl.edu WWW: http://conference.ifas.ufl.edu/aw/

11TH ANNUAL SOUTHEASTERN LAKES MANAGEMENT CONFERENCE.
March 18-20, 2002. Winston-Salem, North Carolina.

The theme: "Lakes, Rivers and Streams--Waters for All". The objectives of this meeting are to explore ways to restore, enhance and preserve; to exchange ideas; to promote local actions; and to facilitate communication among managers, planners, developers, homeowners' groups, agency staff, scientists, industry reps and students and teachers.

Contact: Barbara Wiggins, Conference Chair, 550 Elk Mountain Scenic Hwy, Asheville, NC 28804-1710, (828) 254-5644; E-mail: bswiggins@worldnet.att.net; WWW: http://www.don-anderson.com/senalms2002

8TH CONFERENCE OF THE CONTRACTING PARTIES TO THE RAMSAR CONVENTION.
November 18-26, 2002. Valencia, SPAIN.

The theme: "Wetlands: water, life, and culture". Ramsar member countries meet once every three years to assess the progress of the Convention and wetland conservation, share knowledge and experience, and plan their work of the next three years. The meeting will be held in the world-famous Science Museum Principe Felipe (designed by Santiago Calatrava). The technical sessions are: 1: Wetlands - major challenges and emerging opportunities in the new century; 2: Wetland inventory and assessment; 3: Practical steps for applying the vision for the Ramsar list of Wetlands of International Importance; 4: Managing wetlands for sustainable use: lessons learned and new perspectives; and 5: Cultural aspects of wetlands as a tool for their conservation and sustainable use.

Contact: Ramsar Convention Bureau, Rue Mauverney 28, CH-1196 Gland, Switzerland; Telephone: +41 22 999 0170; FAX: +41 22 999 0169; E-mail: ramsar@ramsar.org WWW: http://www.ramsar.org/index_cop8.htm

11TH INTERNATIONAL CONFERENCE ON AQUATIC INVASIVE SPECIES.
Rescheduled to February 25-March 1, 2002. Hilton Alexandria Mark Center, Alexandria, Virginia.

Hosted by the US Army Engineer Research and Development Center, this conference deals with aquatic animal and aquatic plant invaders, and will feature talks on prevention, rapid response, and management; global and regional environmental impacts; habitat/ecosystem changes; monitoring and information exchange; education and outreach initiatives; ballast water and shipping; and control technologies.

Contact: Conference Administrator, 1027 Pembroke Street East, Suite 200, Pembroke, ON K8A 3M4 Canada; Telephone: 800-868-8776 (North America) or 613-732-7068 FAX: 613-732-3386; E-mail: profedge@renc.igs.net WWW: http://www.aquatic-invasive-species-conference.org

4TH ANNUAL SOUTHEAST EXOTIC PEST PLANT COUNCIL SYMPOSIUM.
April 3-5, 2002. Renaissance Hotel, Nashville, Tennessee.

State chapters of the SE-EPPC include Florida, Georgia, Tennessee, North and South Carolina, Mississippi, and Kentucky. This year's meeting will be hosted by the Tennessee Exotic Pest Plant Council.

Contact: Southeast Exotic Pest Plant Council, 4824 Torbay Dr., Nashville, TX 37211; WWW: http://www.exoticpestplantcouncil.org/ E-mail: bugwood@arches.uga.edu

EUROPEAN WEED RESEARCH SOCIETY 11TH INTERNATIONAL SYMPOSIUM ON AQUATIC WEEDS.
September 2-6, 2002. Moliets et Maâ (Landes), France.

Papers are invited for the following sessions: biology and ecology of aquatic plants; relations with other abiotic and biotic components of aquatic ecosystems; invasive aquatic plants; bio-indication methods involving aquatic vegetation; management and conservation of aquatic plants; integrated management; uses of water plants. Contributions on other aspects of the biology, ecology and management of aquatic plants will also be considered. English-French simultaneous translation will be made.

Contact: Cemagref, Unité de Recherche Qualité des Eaux, 50 Avenue de Verdun, 33612 CESTAS CEDEX, France. E-mail: ewrs.2002@bordeaux.cemagref.fr

FIRST LATIN-AMERICAN SHORT COURSE ON BIOLOGICAL CONTROL OF WEEDS.
June 24-28, 2002. Montelimar, Nicaragua.

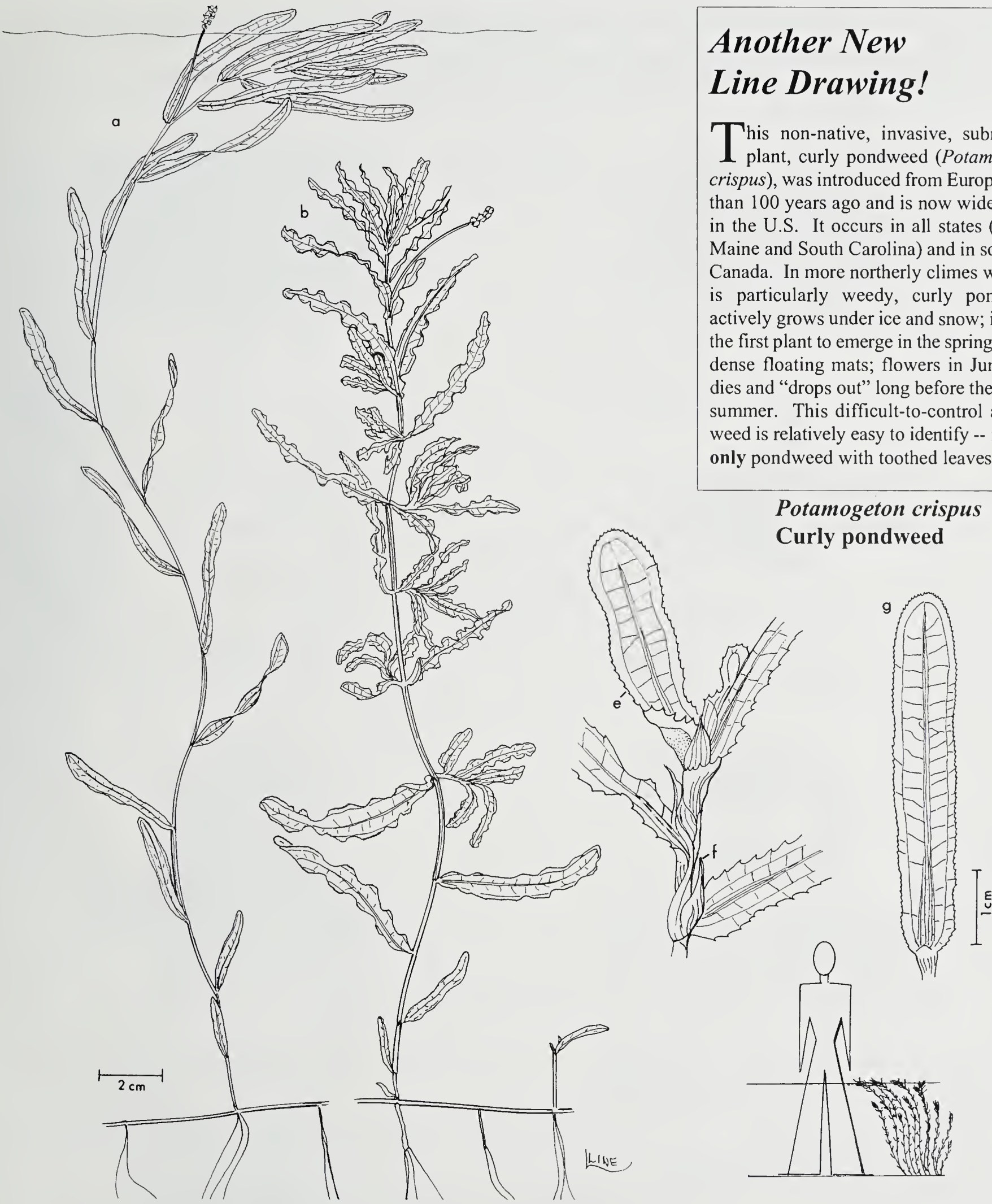
Organized by the University of Florida and the Universidad Nacional Agraria. The objective of this course is to provide participants with a basic understanding of the principles and concepts of biological control of weeds using insects and pathogens. Participants also will receive training in implementing a weed biocontrol program. No previous experience in biological control of weeds is required. Most talks will be in Spanish.

Contact: Dr. Julio Medal, University of Florida, Entomology Dept., PO Box 110620, Gainesville, FL 32611; E-mail: medal@gnv.ifas.ufl.edu

Another New Line Drawing!

This non-native, invasive, submersed plant, curly pondweed (*Potamogeton crispus*), was introduced from Europe more than 100 years ago and is now widespread in the U.S. It occurs in all states (except Maine and South Carolina) and in southern Canada. In more northerly climes where it is particularly weedy, curly pondweed actively grows under ice and snow; is often the first plant to emerge in the spring; forms dense floating mats; flowers in June; and dies and "drops out" long before the end of summer. This difficult-to-control aquatic weed is relatively easy to identify -- it is the **only** pondweed with toothed leaves.

Potamogeton crispus
Curly pondweed



This line drawing was just completed by Laura Line, Center for Aquatic and Invasive Plants, University of Florida. With proper attribution (**Copyright 2001 University of Florida, Center for Aquatic and Invasive Plants**), and for non-profit purposes only, please feel free to use these line drawings for manuals, brochures, reports, proposals, web sites ....

Traditional medicinal knowledge about an obnoxious weed Jal Kumbhi (*Eichhornia crassipes*) in Chhattisgarh (India)

by P. Oudhia, Department of Agronomy, Indira Gandhi Agricultural University, Raipur 492001, India, E-mail: pankaj.oudhia@usa.net

Water hyacinth is the most predominant, persistent and troublesome aquatic weed in India. It was first introduced as an ornamental plant in India in 1896 from Brazil (Rao, 1988). In Chhattisgarh, water hyacinth grows as a pond weed and also as a rice weed in lowland fields. In ancient Indian literature, it is clearly mentioned that every plant on this earth is useful for human beings, animals and also for other plants (Oudhia, 1999a). Many medicinal, industrial and allelopathic uses of common weeds have been reported (Oudhia, 1999b; 1999c). The natives of Chhattisgarh use many common weeds to treat their health problems (Oudhia, 1999c; 1999d).

In order to list the existing medicinal uses of the obnoxious weed *Eichhornia crassipes*, a survey was conducted during the year 2000. The survey was conducted in six selected districts of Chhattisgarh state. From each selected district, two blocks were selected and from each block, a random sample of four villages was taken to make a sample of 100 respondents. Information regarding existing uses was collected through personal interviews.

The survey revealed that many natives are using the water hyacinth as a medicinal plant. It is mainly used as a remedy to treat the goitre disease. Two basic formulations were identified as the most frequently used:

1) Fresh water hyacinth, table salt and Pippali (*Piper longum*), a common herb, are mixed in equal quantity. 12 grams of this mixture are prescribed for a patient daily until relief is gained.

2) Dried water hyacinth is burnt and taken with fresh cow urine.

In Chhattisgarh, water hyacinth also is used as a styptic. Natives apply fresh juice of the weed in fresh wounds. It is believed to stop the spread of infection. For rice farmers, it is one of the best first aid remedies for minor injuries. In septic wounds, it is applied with vinegar.

The above mentioned uses of water hyacinth have not been reported in available literature. This survey suggests there is a strong need to identify the potential medicinal uses of this obnoxious weed so that it can be used for the welfare of human beings.

Line drawing by Ann Murray

References:

Oudhia, P. (1999a) Medicinal weeds in rice fields of Chhattisgarh (India). *International Rice Research Notes* 24(1):40.

Oudhia, P. (1999b) Medicinal weeds in groundnut fields of Chhattisgarh (India). *International Arachis Newsletter* 19:62-64.

Oudhia, P. (1999c) Studies on allelopathy and medicinal weeds in chickpea fields. *International Chickpea and Pigeonpea Newsletter* 6:29-33.

Oudhia, P. (1999d) Medicinal weeds in wheat fields of Chhattisgarh (India). *Rachis* 18(1):40-41.

Rao, V.S. (1988) *Principles of weed science.* Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi (India), 544 pp.

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Thank you!!

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A Q U A P H Y T E

This is the newsletter of the Center for Aquatic and Invasive Plants and the Aquatic, Wetland and Invasive Plant Information Retrieval System (**APIRS**) of the University of Florida Institute of Food and Agricultural Sciences (IFAS). Support for the information system is provided by the Florida Department of Environmental Protection, the U.S. Army Corps of Engineers Waterways Experiment Station Aquatic Plant Control Research Program (APCRP), the St. Johns River Water Management District and UF/IFAS.

EDITORS: Victor Ramey
Karen Brown

AQUAPHYTE is sent to managers, researchers and agencies in 71 countries around the world. Comments, announcements, news items and other information relevant to aquatic and invasive plant research are solicited.

Inclusion in *AQUAPHYTE* does not constitute endorsement, nor does exclusion represent criticism, of any item, organization, individual, or institution by the University of Florida.

Scleria lacustris in Florida

Emergent with maidencane (*Panicum hemitomon*) and *Eleocharis* spp. in 30 cm of water, *Scleria lacustris* exceeds a height of 1.5 m. *Photo by Vic Ramey.*

See article and line drawing on pages 2-3